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vol. 15 #176

August 1961

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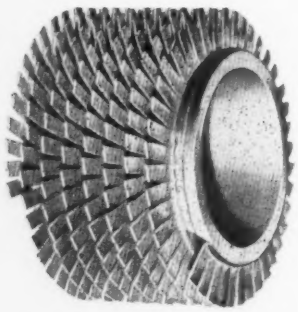

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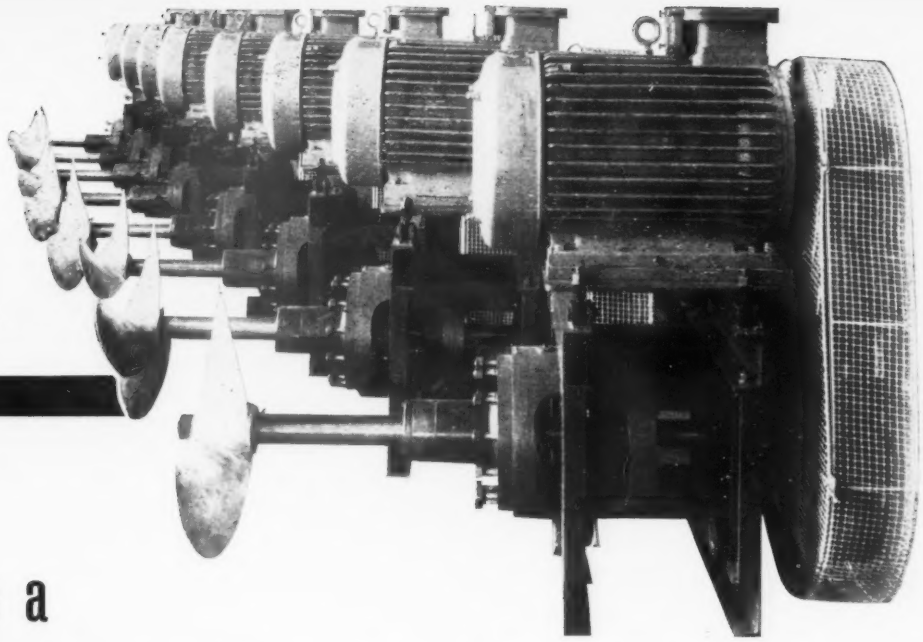

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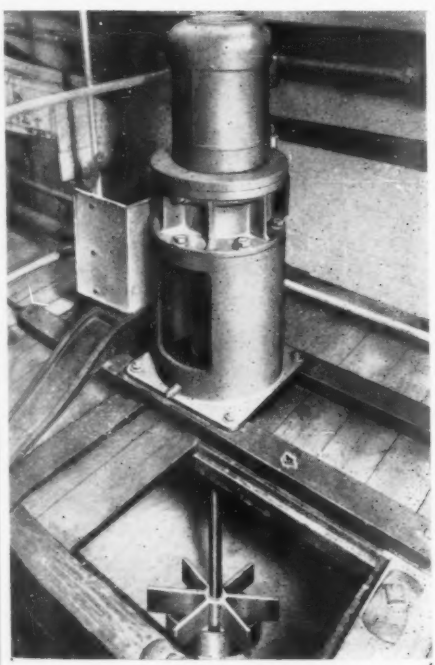

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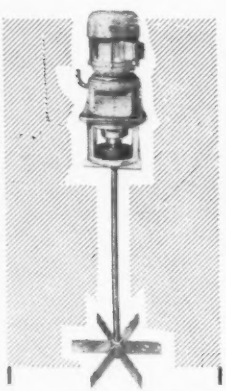

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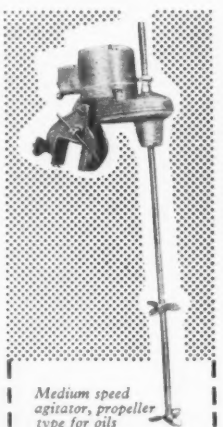

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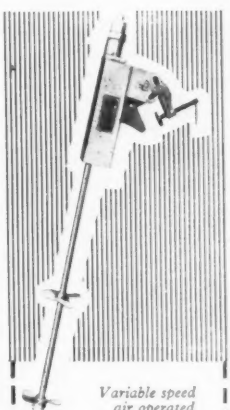

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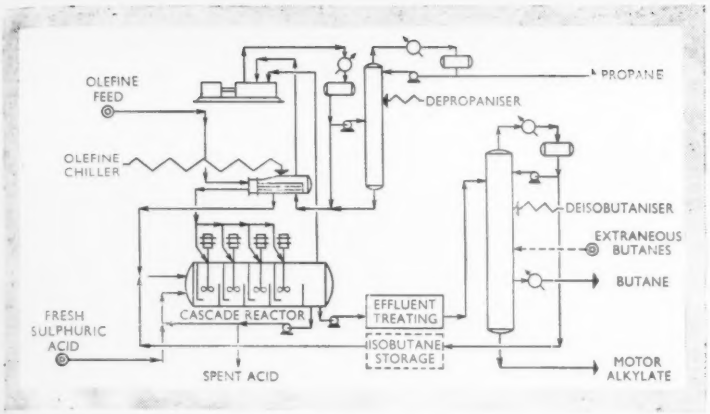

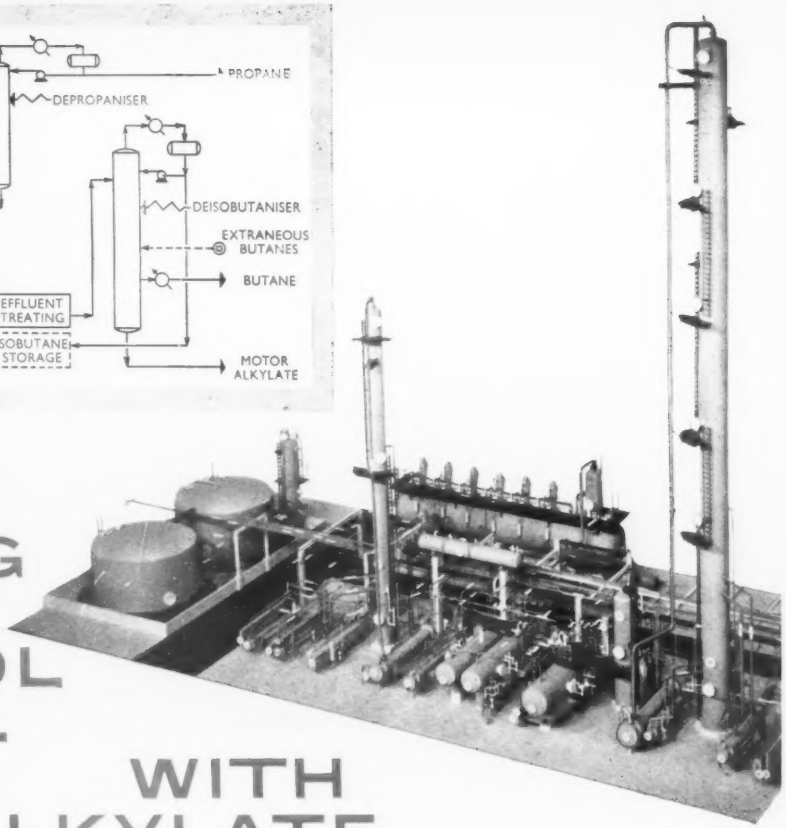

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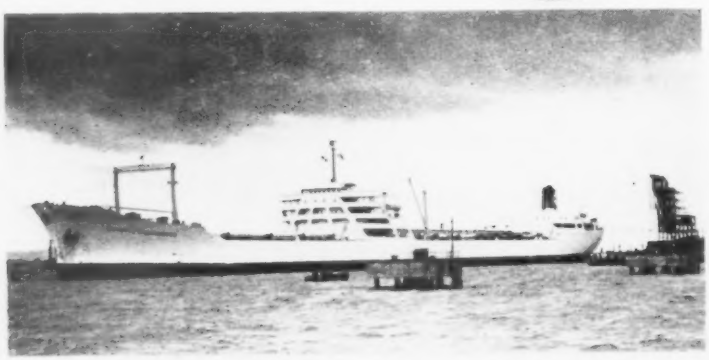

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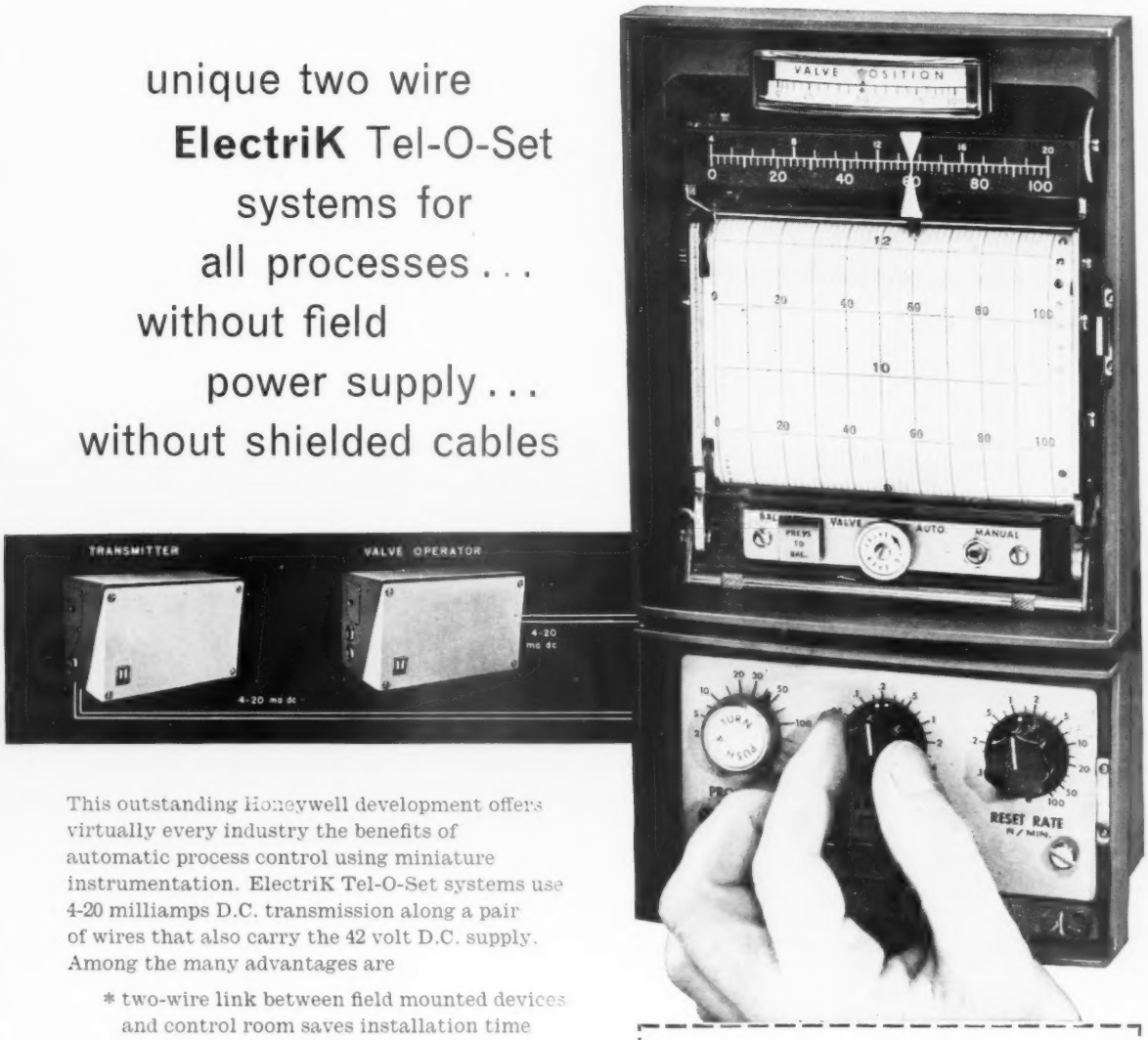

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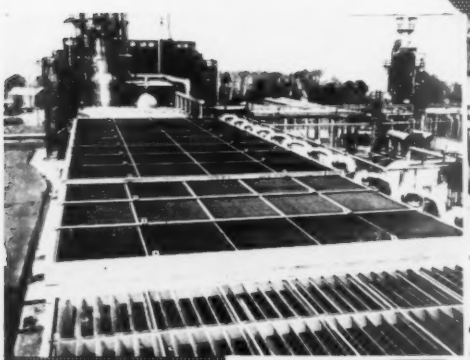

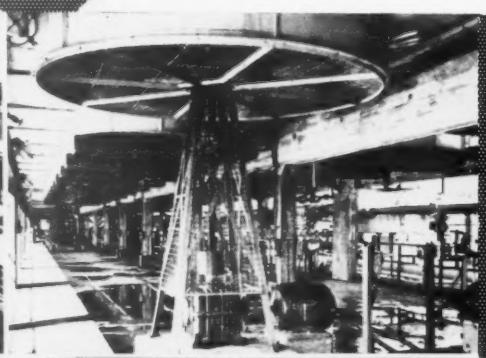

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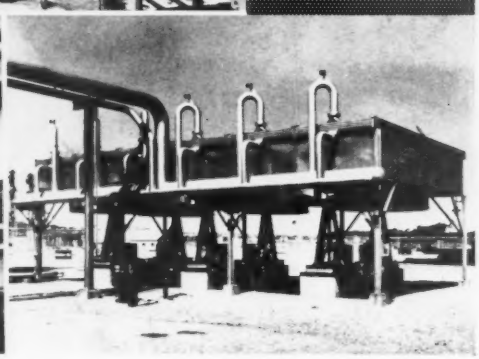

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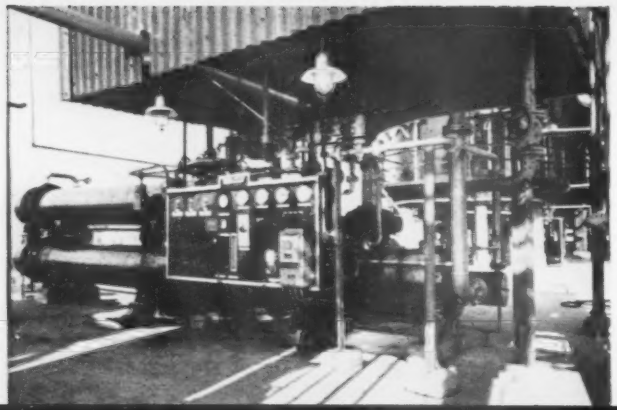

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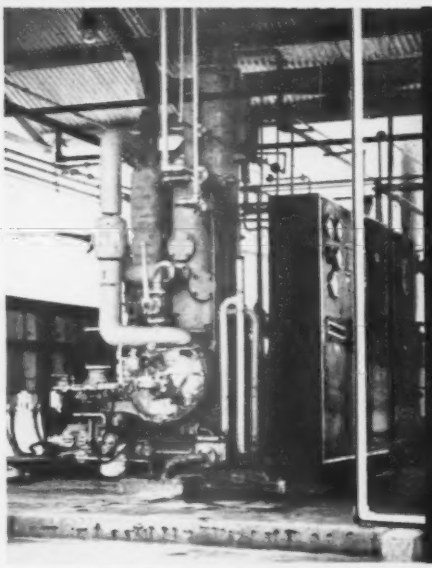

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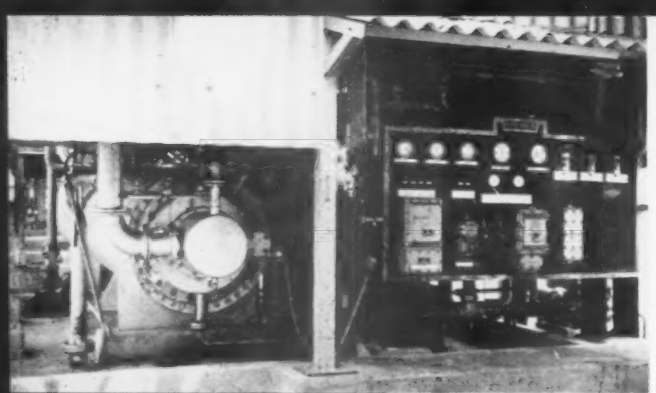

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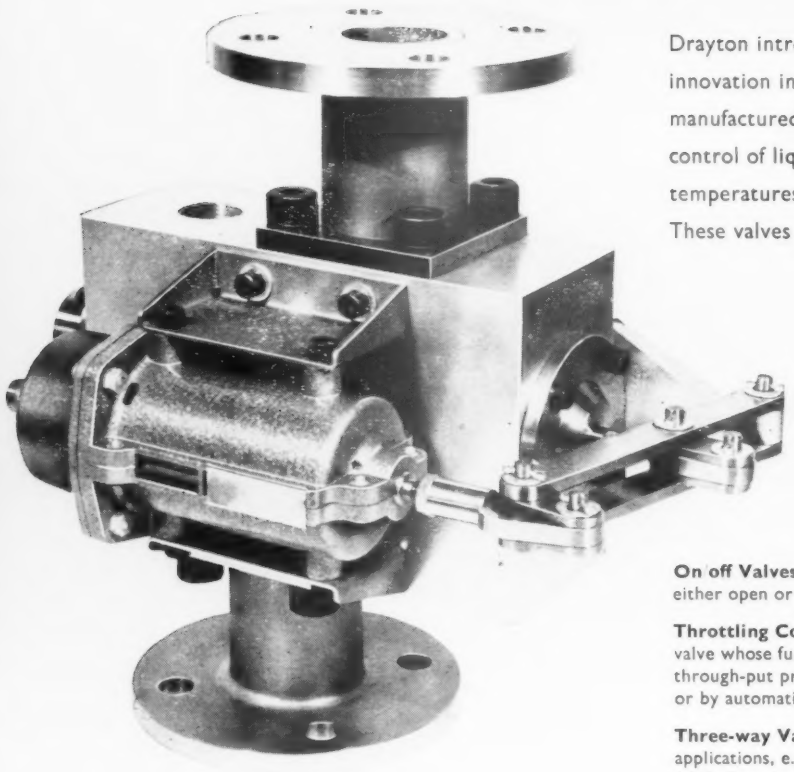

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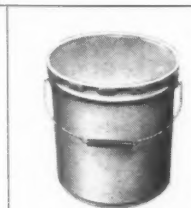

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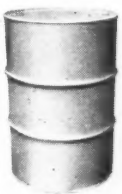

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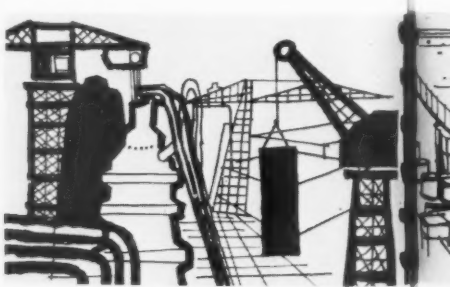

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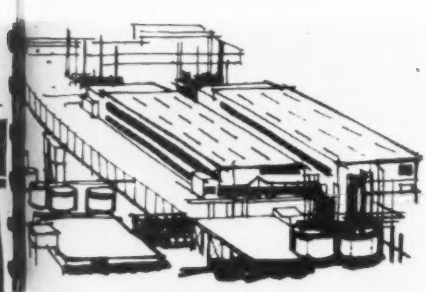

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REVIEW

Volume 15, No. 176 August 1961

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Information and its Dissemination

THE 1961 SUMMER MEETING

Since the first full-scale IP Summer Meeting at Buxton in 1953 each of these immensely pleasurable technical and social "get-togethers" has been voted a complete success. This year's event, held at the Old Swan Hotel, Harrogate, was no exception, and the general theme of information and its dissemination was in many ways complementary to the previous year's subject of aids to productivity in the oil industry. In 1960 the papers were concerned mainly with the use of automatic and electronic methods of production. The means of conveying information to workers in all sections of the industry, and to research workers in particular, is of equal importance.

The Venue

Grainge's *History of Harrogate* tells that the Swan Inn existed in Low Harrogate before 1700 "it was a low concern—not morally, but structurally". It is gratifying that the historian drew a distinction between the two meanings of the adjective low, as, through the two and a half centuries during which the hotel has served the traveller and congressman, great developments have taken place keeping the hostelry thoroughly abreast of the times, and highly esteemed.

In the early days the Swan Inn was on the historic coaching road from York to Lancaster. The old cellars under the main entrance hall can clearly be seen, where three generations of Jonathan Shutt, private owners of the hotel, brewed their ale and mulled it. These cellars provided a delightful background for the wine tastings offered to delegates by the contemporary host, Geoffrey Wright.

The last of the Shutt dynasty was Isaac Thomas, an architect and surveyor who designed the pump house nearly opposite the main hotel entrance, which housed the main sulphur well which brought such renown to Harrogate for one hundred years after about 1850.

In 1825 the Swan Inn was rebuilt as the Swan Hotel, and in 1878 the Harrogate Hydropathic Company took over and expanded the hotel to its present size, including the fine Ballroom and Garden Room suite, where the technical sessions and much of the social programme of the Summer Meeting were held.

Up to 1939 the hotel operated as a hydropathic establishment, and had its own suite of medical baths. After the war, however, Harrogate became important as a conference town and hydropathic treatment was diverted towards the magnificent Royal Baths which now serve not only private patients but also the National Health Service.

In the post-war years the Old Swan has been patronized by many conferences. During the summer, tourists from Britain and overseas arriving at the hotel find themselves welcomed by the Old Swan's hornblower, who might well have been left behind from the last horsedrawn coach which visited the hotel more than a century ago.

The venue of the 1961 Summer Meeting—The Old Swan Hotel, Harrogate

Attendance

Total attendance was 145, which was up to the usual number present at previous Summer Meetings, and the President, Julian M. Leonard, and Mrs Leonard, were supported by the following members of Council: W. S. Ault and Mrs Ault, J. H. M. Clark and Mrs Clark, A. J. Foster and Mrs Foster, Dr T. F. Gaskell, W. E. Madden (*members of Council*); Dr E. B.

At the President's table for the dinner-dance: D. A. Hough (IP General Secretary), Mrs E. M. Benjamin, and the President, Julian M. Leonard

Evans (*honorary editor*) and Mrs Evans; G. A. Dickins (*honorary secretary*) and Mrs Dickins.

THE TECHNICAL SESSIONS

The six papers were presented as usual in three sessions. At the first session, on the Thursday morning after the President's opening address, the chair was taken by J. C. Gridley. For the second session, on Friday morning, W. S. Ault was the chairman; and in the afternoon the President presided. The meeting room itself and the general facilities there were exceptionally fine, being probably the best encountered at any Summer Meeting to date.

Planning an Information Service

The opening paper by E. H. E. Jones (*Central Information Services, Shell International Petroleum Co. Ltd*) presented the introduction to the theme of "Information and its Dissemination"—"this problem child of our generation" as it was termed by the author.

The accelerated interest in the subject over recent years was explained by the greatly increased rate of the contribution to human knowledge, together with the demand for rapid distribution of new knowledge to governments, economic enterprises, and scientific institutions. The author pointed out that the six papers were intended for the user of information at all levels rather than for the information specialist, for it was vitally necessary that the former should be clearly shown just what was being done at present in the information field, and why.

Explaining the meaning of the title of his paper "Planning an Information Service", Mr Jones said that the "Service" part broadly included acquisition, selection, storage, retrieval, and communication. There was to-day a greater emphasis on anticipating the user's needs without being asked, and in addition there was a much more lively appreciation of the relative value of speed, accuracy, depth, and economy in relation to each type of information required. As a result the need for close and constant contact between the supplier and user, and a proper recognition of the higher calibre of information staff required to-day was apparent as never before.

"Information", it should be clearly understood, implied not only knowledge but the need to impart it, and the user required more attention to what had been described as "the problem of how to organize the middle zone between the production and the use"—whilst information also required quickly relating to its context, and in the petroleum industry the occupational field was very wide.

After describing Planning as "working out in advance a course of action" (to which time and money had to be devoted so as to avoid the all too common drifting into day-to-day activities with *ad hoc* changes made as a result of immediate pressures), Mr Jones went on to examine some aspects of an information service which lent themselves to development through planning. These included contact between user and information unit; the co-ordinating role; staffing; the study of reading habits and requirements; classification schemes; access to sources; equipment; and internal records, statistics, and costs.

In conclusion the author pointed out that the rapid growth of knowledge in the petroleum industry, together with the speed and diversity of its development and application, was putting strains on the information machine connecting these two factors. Undoubted changes in information techniques were in the air. Co-operative investigations needed to be made by producer, user, and the information specialist to ensure that the right type of information machine was being applied, and whether a better design could do the job more efficiently.

Operation of an Information Service

The second paper, by W. T. Knox (*Technical Information Division, Esso Research and Engineering Company*) was presented by Dr R. M. Hill of the same company in the U.S.A. The subject of the paper, it was said, was concerned with what has been defined as "the operation in general"—the area between the planning of an information service and detailed discussions of some of its major facets. Some general fundamental principles governing an information service and its relation to its clients were presented.

It must be remembered that the information service was not an end in itself, but was a device whereby its users obtained information to help solve their daily problems. The user did not want to concern himself with the details of the service's operation, but only wished for service of the type and degree requested, when he wanted it, and at a reasonable price. Many users to-day were dissatisfied with the present

The hotel's hornblower welcomes visitors

DELEGATES IN THE COCKTAIL LOUNGE AND THE DINNER-DANCE AT HARROGATE

Mrs W. E. Cullinan, A. J. Wilcocks (*Kuwait Oil Co. Ltd*), and A. C. Phipps (*Petroleum Times*)—A Mobil group: Mrs R. M. Measures and G. A. Dickins and Mrs Dickins—G. W. Thomas, V. Biske and Mrs Biske.

Part of the Shell-Mex and B.P. table enjoying the dinner-dance—Lord Bangor and A. J. Hervey (*Petroleum Information Bureau*) kicking off at their first Summer Meeting—Esso discussing information: J. G. Hall, H. P. Hodge, and Miss J. A. Teagle.

George Sell relaxes at his first non-duty Summer Meeting with Mrs Sell, G. Heseldin, and Mrs J. Cummings (*IP*)—Mrs Benjamin and E. M. Benjamin with Lt-Col A. C. Galloway—A Kuwait Oil discussion group: Mrs Allen and P. R. Allen, and R. P. Nelson and Mrs Nelson.

Some regular delegates: J. T. T. Robinson, Mrs Sherlock, Col Oliver Sherlock, and Mrs Robinson, with Mrs J. W. Hutcheson —Those presenting two of the papers discuss tactics: Dr R. M. Hill and A. Mosley—and K. A. D. Inglis (*BP Trading Co. Ltd*) and Mrs Inglis, with D. D. Hayter (*Iraq Petroleum Co. Ltd*) in the centre.

The impressive backdrop to the meeting dais

information system. We were in an industrial society, it was pointed out, which was dependent on active exploration of information for its forward momentum and continued progress.

It was described how the individual had to be shown in an unobtrusive manner how the service could be of specific use to him in a more effective manner than his own personal methods of acquiring information. The user had to be quietly educated into the use of the central information service.

After discussing the necessity and difficulty of obtaining information staff from people whose original career interest lay in other fields (previous users)—it was easy enough to attract trained librarians—the author went on to consider some of the specific operations entailed in the operation of an information service, such as material acquisition and storage, the dynamic processing of available literature, the retrieval of information, and the development of techniques by constant study.

Finally there was a brief discussion of the relation of the service to other departments, the following up of information service actions to determine their effectiveness.

Technical Information Retrieval

In the third paper C. W. Hanson (*Aslib*) recalled that studies had revealed that many industrial units spent almost half their working time engaged in communication—much of it oral. Clearly it was worthwhile making it as efficient as possible.

It was pointed out that, although the paper was concerned primarily with the retrieval of written and usually published information, people as well as documents were stores of information. Records of useful contacts should be maintained and casual "shop" talk need not be regarded as necessarily a waste of time.

In dealing with the main subject of information retrieval from documents, Mr Hanson said that the information needed by a technologist might be non-technical as well as technical—analysis had shown that as many as 18 per cent of a technologist's questions often came into this category. Therefore such general reference information should also be to hand.

The places in which to find technical information were indicated. Technologists often required much information on subjects outside their special field and the searching would also include publications other than those obviously devoted to the subject of the enquiry. As much as two-thirds of the important periodical literature of a subject could be expected to be found in these other subject journals.

The author went on to consider the means of finding the information; the tools for the search—the library card index, abstract periodicals, and bibliographies; and the procedures to adopt in the search for information. The final section of the paper mentioned briefly the pioneering work now being done by some organizations into the possibilities of mechanical methods of handling information. These gave promise of enabling the specialized literature of a subject to be searched in depth and at high speed. Nevertheless, these would not solve the whole problem of "finding what you want, when you want it". Although the provision of frequently-needed factual information within a well-defined field might be greatly improved, the more varied needs of an organization which extended far outside its central subject would still have to be met to a considerable degree in the future by the kind of non-mechanized procedures outlined in the paper. Looking into the distant future, the author foresaw the use of a large mechanized system, probably operated by a central institute for each main branch of science and technology, and supplemented by the confidential report literature of the larger organizations, when detailed searches of virtually all the literature on a narrow subject were required.

The Presentation of Technical Information

In his paper G. W. Thomas (*BP Research Centre*) emphasized that as our technology became more complex and the number of people involved increased, the need for effective written communication was rendered more important. The principal elements of good writing—accuracy, clarity, simplicity, and readability—were discussed briefly, and the question was then posed as to what methods could be utilized to improve the written communications of technologists. The answer was said to be by writing courses, internal editorial units, or company publications committees, and the work of each of these was described.

Two of the more significant forms of technical literature—the formal technical report and the technical paper—were then discussed. The fundamental differences between the two were that the former had a captive audience, whereas the latter was competing for publication and had to capture and hold its audience.

The technical report was said to be reviewed probably more critically than any other form of technical writing. Although accuracy was the criterion, the organization of the report was often found to be a stumbling block. The organization into different parts was described and the importance of careful attention to the prefatory parts was emphasized.

Some of those listening to the guide telling of the history of Fountains Abbey on the Thursday afternoon excursion

The three questions which an author should bear in mind before writing the technical paper were said to be: is the paper designed for the prospective audience? will the paper maintain listener or reader interest? and does the paper match up to journal specifications? Once again organization was said to be the key to a successful paper, and a last point was that the paper should enable a reader to feel that he was doing his own thinking, not merely following.

The final section of Mr Thomas' paper gave a brief description of various types of illustrative material, such as line drawings, graphs, histograms and charts, and tables.

Internal Communications and Employee Information

The first point in the paper by R. E. Cooper (*Employee Relations Department, Esso Petroleum Company Ltd*) was that to keep any company running smoothly the employees must be kept informed of what was going on in their organization.

It must be a fundamental principle that the responsibility for good communication must always rest with line management at all levels. Formal techniques, such as the house magazine, joint consultation, induction courses, etc., could do no more than supplement these line channels, for personal face-to-face communication was always the most effective method of exchanging information. It was because of the danger inherent in relying too strongly on formal techniques that the author devoted more attention in his paper to the attempt to create the sort of climate in which problems were least likely to arise.

The maintenance of sound morale in order to disseminate adequate employee information was stressed, and it had been found that presenting the basics of a problem to employees and then inviting them to discuss it, so that by this two-way flow the greater part of the information was brought to light only by the employees involving themselves personally with the problem and asking questions, was always more effective than a simple presentation of the whole problem.

Communication from shop floor to management was shown to be equally important to the downward flow of information. Without it top management could not take realistic decisions, secondly it was extremely wasteful not to tap the immense store of useful experience existing throughout an organization, and thirdly the worker's morale and sense of fulfilment in what might be a monotonous job would be greatly improved if he felt that his ideas and opinions were being welcomed.

The third type of information flow described by the author was "horizontal" flow—the sideways exchange of information between individuals or groups. This avoided wasteful overlapping of work and obviated too much mental compartmentalization in this age of the specialist.

The General Secretary and his secretary relax at the dinner-dance after all their organizational endeavours

After discussing why internal communications were necessary and what they could achieve, the author concluded by giving details of what information should be communicated and the basic principles in employee communication; sincerity, speed of information, "follow-up", checking up on the information's effectiveness, and lastly the danger of overcommunication.

Informing the Public

As the previous five papers had dealt with the planning and operation of *internal* information services, both technical and non-technical, within an organization, it was fitting that the final paper of the meeting should be on an organization's external information services to the public. This question of press and public information could, as the author A. Mosley (*Public Relations Section, Mobil Oil Co. Ltd*) pointed out, serve as the theme for an entire meeting of its own. In an endeavour to explain why public information was required, what public had to be reached, what information was to be given to the public and by what methods, and who did the informing, Mr Mosley presented a fictional case history of a company's efforts in trying to create a favourable climate for the marketing of a certain chemical preparation. The problems of the need for larger factory space and a consequent building of a new plant in a rural area, and the informing of the company staff and the inhabitants of the new locality were discussed. Trying to combat local hostility, ensuring that people in the "home area" were relieved of any fears of redundancy, and persuading key staff to move to the new factory, were some of the initial problems encountered by the public and employee relations staffs.

Some spent the last evening on the dance floor, and others in earnest conversation

With the launching of the new product itself, the author described the part played by newspaper and television advertising, and sales promotion by direct mail campaigns and point-of-sale material, in passing on information concerning it to the public. In addition, press conferences were held to inform the newspapers of the story of the new product and its development and manufacture. Mr Mosley then assessed the results that had been achieved in the work of information in the mythical case.

It was emphasized that an increasing number of companies were realizing that advertising and sales promotion were no longer sufficient. No large company could live to-day on its products alone. Because of its size, the profit it made, the work it did, or the market it served, there would always be people who would read into its activities an implication that the public interest was being impaired. No company could to-day shut itself off from the public, it must sell itself as well as its products.

In conclusion, the author listed some of the ways in which a company could sell itself; by "local employee" news to the press, by news of educational endowments, research achievements, and improved processes, etc., means whereby a company could show to the public that it had a social conscience, that it realized its obligations to the community in which it lived.

Votes of Thanks

The chair for the closing session was taken by the President, Julian M. Leonard, who said he had great pleasure in offering thanks to the many people who had contributed to the success of the Summer Meeting.

Delegates had heard a selection of six papers which covered the whole possible range of the subject as far as the oil industry was concerned. Thanks were due to the authors of each of the papers which had contributed so successfully to the theme, and to their respective companies for giving them permission to present the papers. The work of Dr Evans and his Publications Committee had been made easy by the ready and cheerful help given by the authors.

Thanks were also given to his fellow chairmen, Mr Ault and Mr Gridley, for supervising the sessions so ably, also to Dr Evans, Mr Samuel, and the Papers Sub-Committee for their work in gathering the papers.

Special thanks were also due, the President said, to the IP staff, who had done a fabulously good job, particularly to the General Secretary, Mr Hough, and to Mr Wells, the Editor, both of whom had spent many months work in the organization of the meeting.

In conclusion, the President said that he had obtained a great deal of pleasure from this important conference, and if other delegates had also he hoped that it would give them an incentive to attend next year's Summer Meeting at Gleneagles.

Social Events

Beginning with the informal cocktail party on the Wednesday evening—which started with considerable promptitude when some were chased in by a sudden downpour—and throughout the usual social programme, ending on Friday night with the dinner-dance, the social events were all much enjoyed by the members and their wives.

The main excursion was that to Fountains Abbey on Thursday afternoon. The party was split up into two, and under the extremely expert guidance of two senior members of The Friends of Harrogate both groups were conducted around the ruins of the Norman Abbey and its grounds. Such was the historical knowledge of the guides, and the realization of the impressive feats of building that must have been required with primitive tools, that many found the Abbey ruins of great interest.

By the time that the party had returned for tea to a teashop of a slightly later age in Ripon market place the afternoon had been acclaimed a great success.

Throughout the meeting, in addition to the organized programme, everyone enjoyed the opportunities that were offered by the fact that it was French Week in Harrogate. Such opportunities that were offered by this furtherance of the *entente cordiale* included wine tasting in the cellars of the Old Swan itself, browsing around the stalls of paintings and other crafts on display in the town, or merely looking around Harrogate's very fine shopping centre.

Excellent golf was had by some members at the Pannal Golf Club, where the splendid heather and moorland course is one of the best-known in the north of England.

Finally, it should not be forgotten that several members and their wives enjoyed themselves on the hotel croquet lawn. Those who were initiated into the mysteries of the game soon realized that the legend of a gentle harmless sport played on the shaded country lawns of inoffensive ecclesiastics was a myth. One learnt that although Lewis Carroll's flamingoes were not available there were other forms of gamesmanship, which included what was said to be the American game which was based on hitting the ball one-handed in the opposite direction to which the striker was facing!

It was generally agreed that in every way the 1961 Summer Meeting had been well up to standard.

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REDUCED SUBSCRIPTIONS FOR RETIRED MEMBERS

The Council of the Institute has been giving some thought to the possibility of introducing a special scheme for retired members to continue their membership at a reduced annual subscription, provided they have been associated with the Institute for a considerable period of time and have retired from a full-time position in the industry.

A scheme has now been approved and will come into force from 1 January 1962.

Any member of the Institute of Petroleum may apply to the General Secretary to continue his membership of the Institute at an annual subscription of £1 1*s* 0*d* per annum, whilst continuing to receive all the rights and privileges of full membership, providing the following conditions are fulfilled:—

(*a*) The member must have retired from full employment in the industry.

(*b*) The member must be 65 years of age and have been a member of the Institute of Petroleum for a period of not less than 20 years.

*Dieselization on Southern Region of British Railways**

By **M. R. PIERSON†**

In the early 1930's consideration was given by the former railway companies to the use of diesel traction on the railways, and in 1936–37 three 350 hp diesel electric shunting locomotives were built for the Southern Railway. These locomotives were not unlike those frequently seen to-day in external appearance, but the diesel engine and generators were basically of industrial design.

The diesel engine, provided with automatic load control of a very early and unreliable design, was rigidly coupled to a main generator, which provided current for traction purposes, and an auxiliary generator for battery charging, lighting, and control circuits was overhung on an extension of the main generator shaft. The four-stroke six-cylinder naturally aspirated engine with 10-in dia cylinders and 12 in stroke developed 350 hp at 680 rev/min, and the engine speed was controlled by electrically operated servo mechanisms operating on the governor, which was of early conventional design. Power was transmitted to the road wheels by means of two axle hung nose suspended traction motors through straight spur gearing.

Although nearing the end of their useful life, these three locomotives are still in service to-day. They were the forerunners of diesel traction on the Southern and proved the soundness of the basic design and the economic advantage of diesel traction over the rather wasteful steam counterpart.

Post-War Dieselization Programme

The war halted the progress of dieselization and it was not until 1947 that further diesel shunters were built, and these were very similar in principle to the early counterparts. The essential details of the engine remained unaltered, but during the 20 years which elapsed design changes were made to make the unit more suitable for traction. Torque control was dispensed with, and variable engine speed control by means of mechanical linkage was introduced which, combined with variations in generator field excitation, provided a satisfactory and simple means of controlling the engine output. Considerable improvement was also made in the design of the electrical machines and equipment, all of which have been beneficial, and although nose suspended motors are still employed, double reduction gearing was introduced to provide the necessary performance characteristic. This type of locomotive is now standard throughout British Railways and some 1500, all of the same basic design, are in service.

A rather smaller number of diesel mechanical locomotives of 204 hp are also in use for shunting purposes in docks and lightly loaded yards. These locomotives are of conventional design with four-speed gear boxes and are more economic to operate than the diesel electrics on light duties.

Shortly after the introduction of the diesel shunters, work commenced on three prototype main line locomotives, two of 1750 hp and one of 2000 hp. A sixteen-cylinder supercharged vee engine was used direct coupled to a main generator for traction current with an overhung auxiliary generator for battery charging, etc. Automatic load control was provided, and engine speed control was by means of a solenoid operated servo mechanism giving a number of fixed steps on the 1750 hp locomotives. Power was transmitted to the road wheels by means of six nose suspended, axle hung traction motors through straight spur gearing. Engine bore and stroke dimensions were similar to the early shunter engines, but aluminium pistons and copper lead main and big end bearings were used to withstand the higher bearing loads.

An oil fired steam heating boiler was employed for coach heating, but this proved extremely troublesome and led to the present policy on the Southern Region of electric heating for all diesel and electric hauled stock.

The first two 1750 hp locomotives operated on the Waterloo, Exeter, and Weymouth route for a time and whilst they were far from being trouble-free, valuable experience was gained. Much of this experience was incorporated in the 2000 hp locomotive which was similar in design but was fitted with four-valve heads and continuous speed and load control. Experience was still being gained when this locomotive was put into service and much effort was expended in overcoming oil leaks and fuel dilution. The reliability of the locomotives left much to be desired and improvements were still being made when they were transferred to the London Midland Region where they are operating to-day.

Multiple Unit Trains

Many route miles on the Southern are already electrified, and when consideration was given to the use of diesel multiple unit trains on the Hastings line and in the Hampshire area it was decided to employ diesel electrics, much of the electrical equipment being common to both the diesel electric and electric stock. Whilst light-weight diesel mechanicals using a number of light-weight underfloor engines were being introduced on other Regions, an economic survey of the Southern routes showed the medium speed engine with electric transmission to be the most attractive proposition, and this has been proved in practice.

The engine used for this first large diesel scheme was the English Electric four-cylinder supercharged engine, developing 500 or 600 hp at 850 rev/min according to the size of supercharger fitted. The now common 10-in bore and 12-in stroke were again employed together with aluminium pistons with four compression rings and two scrapers, the top ring being chromium plated to cut down bore wear. Four valve heads were a common feature and many design changes had been made to reduce the possibility of fuel dilution.

*Presented to the IP Fawley Branch on 5 October 1960.

†The British Transport Commission.

Automatic load control and stepped engine speed control was provided by the now familiar solenoid operated servo mechanism operating on the governor. Conventional direct coupled main generator and overhung auxiliary generators were provided and two axle hung motors transmitted power to the road wheels through straight spur gearing.

The 600 hp engine is used in the Hampshire three-car units where the additional horse power is necessary to give the performance required for the essentially suburban duties, *i.e.* frequent stops at relatively short intervals. On the Hastings line two 500-hp engines are used in each six-car unit, where, owing to the nature of the line with its numerous speed restrictions, and essentially fast services, the lower horsepower has proved adequate—in fact, any further increase in horsepower would severely increase fuel costs with virtually no saving in time.

Current Developments

Deliveries are now being taken of a number of 1550 hp diesel electric locomotives of conventional design employing the same principles as previously outlined for diesel shunters and multiple units, but four traction motors are employed to transmit power to the road wheels, and a separate generator is provided for train heating.

Many of the diesel electric locomotives operating on British Railways to-day are similar in basic principle, but have been produced by a number of different manufacturers and when sufficient experience has been gained, it will be interesting to obtain a comparative assessment of reliability and initial and running costs.

Whilst diesel electric locomotives are most common, the diesel hydraulic locomotives on the Western Region may well become more numerous in years to come. These represent the first wide-scale application of the high speed engine and hydraulic transmission in the U.K., and good reports have been received of the operation of similar locomotives in Germany. Although they were introduced only comparatively recently, performance of these locomotives is so far up to expectations.

Another interesting trial is being carried out on the *Deltic* opposed piston two-stroke engine with electric transmission and it may well be developed to a very reliable state. It is revolutionary in design with a high rated output and a small physical size which is ideal for main line traction purposes, but very little work, other than minor repairs, can be carried out on such an engine *in situ*.

It is hoped that the high speed engine can be developed to a reliable state with a wear ratio between overhauls comparable with that of the slow speed engine.

Experience to Date

Unfortunately, very little operating experience has so far been gained with the main line diesel locomotives, but considerable information has been gained on both diesel shunting locomotives and the multiple unit diesel electric trains, and this is reviewed briefly below.

Class A fuel oil is used in all applications of diesel traction on the railways, except in one case where low sulphur content fuel of about 0·3 has been supplied. This has had a marked effect on the life of the lubricating oil, but it is debatable whether this would be economic, as costs of low sulphur content fuel are not known, and any increased costs would have to be offset against the saving on lubricating oil.

Until recently, all diesel shunters have operated on a straight SAE30 mineral oil to a British Railways specification, and whilst tests have shown a detergent oil has very little to commend its use in this application, the very healthy competition between the oil companies has resulted in the railways being able to buy detergent oils to MIL DEF 2101 B at a price comparable to that of the straight mineral oil. Since oils to MIL DEF 2101 B are already in use on the main line locomotives and multiple unit trains, the same oil is being used on diesel shunters as they pass through for overhaul. The standardization on one type of oil will enable larger bulk supplies to be bought with price advantage and will result in the engines on diesel shunters remaining in a much cleaner condition as well as giving them a longer oil life since the majority of oil changes are due to insoluble build up.

Lubricating oil analysis is carried out by the area chemist at monthly intervals when the usual checks are made for viscosity, flash point, water, fuel dilution, insolubles, additive depletion, etc., all oil changes being made on the advice of the chemist. Detergent oil changes are normally due to additive depletion, but also in a few cases to fuel dilution and occasionally to insoluble build up. In the case of the straight mineral oil, changes are usually due to insoluble build up.

The lubricating oil system is a full flow system with two *Vokes* fabric filter elements type C23020P in parallel followed by a fine mesh strainer. The initial recommended life of the filter elements was 1000 engine hours, but tests have shown that there is no loss of performance of the filters up to 4000 hours and an extended trial is now being carried out to determine the most economical life of the filter elements.

The life of the oil is infinitely variable and is affected by many factors, *i.e.* type of engine duty, type of fuel oil, grade of lubricating oil, fuel dilution etc.

Bearing all these factors in mind we have quite often achieved a maximum oil life of 7500 engine hours, where low sulphur content fuel has been used, engines are in continuous use some 20 hours out of 24, and the top-up rate is fairly constant, but the average life is of the order of 2500 engine hours.

The average life is considerably lower than the maximum for two main reasons:—

1. Fuel dilution.
2. Additive depletion due to numerous cold starts, which is largely brought about by the pattern of service on the Southern Region to cover the morning and evening peak business services.

The condemnation limits for lubricating oil are as follows:—

Water 0·25 per cent.
Fuel dilution 5 per cent.
Insolubles 2½ per cent.
Additive Depletion 85 per cent for the type of oil at present in use.

Differing operating conditions cause quite a wide variation in oil life which ranges from approx 1700 hr to some 3000 hr or more. The longer life has been obtained on the Hampshire units operating on low sulphur content fuel where the engines are in continuous use some 18 hours out of every 24. The shorter life has been obtained on the Hastings units, many of which have a relatively low utilization factor owing to the morning and evening peak services, which results in many more cold starts. Initially, this was aggravated by a most unsatisfactory thermostatic valve in the cooling system which resulted in too much cold running, but this has been overcome by using a wax element thermostat which has

greatly reduced the cold running but cannot overcome the number of cold starts.

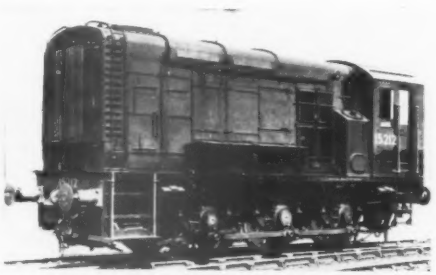
Traction duties are perhaps one of the most arduous as the engine is frequently called upon to develop full load within minutes of being started from cold, and the cyclic operation from no load to full load many times during a journey, coupled with the many track vibrations when in motion, produces conditions not encountered in marine or industrial applications. In view of the arduous conditions of diesel traction, new designs of engines are subjected to 100-hr cyclic load test on the test bed simulating actual operating conditions.

Superchargers have not been free of trouble, due mainly to the nature of the duties required under traction conditions. Distortion of the nozzle diffuser ring occurred as a result of thermal stresses, and this led to stretching of the securing studs and loosening of the nuts, which fouled the turbine wheel causing total failure. This was overcome by fitting more studs and spectacle type locking washers.

Some cases of loss of oil also occurred and this proved to be the result of breakdown of the pressurized labyrinth oil seal caused by carbon build up in the air feed, particularly at idling speed when boost pressure was at a minimum. This was completely overcome by increasing the air feed.

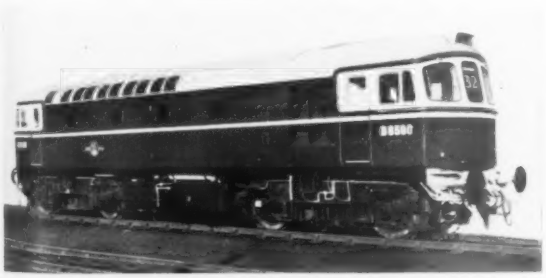
Fuel dilution, caused mainly by numerous small leaks, has also been troublesome. However, many improvements have been made to pipe connexions and incidents of this nature have been reduced to a minimum. Injector HP pipe failures were also common with failure in every case occurring at bending cracks. Since laboratory testing has been introduced, however, this trouble has disappeared.

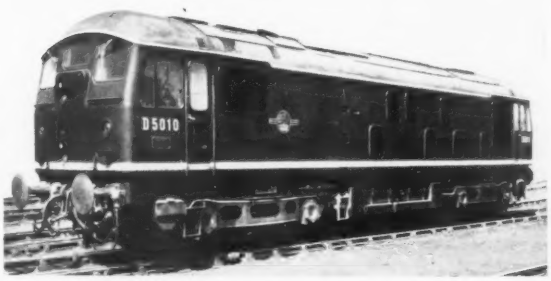
Air filtration is by means of body-side oil wetted filters, and before the introduction of the gel type oils and suitable cleaning plants great difficulty was experienced in keeping the filters in a serviceable condition. Radiator blockage due to soot and dirt knocked down from tunnels by the exhaust is being overcome by thoroughly cleaning all radiators and covering them with a perforated plate in lieu of shutters so that the dirt is trapped before entering the radiator. Considerable wear has occurred on exhaust valve guides and stems and in some cases the valve has actually come into contact with the cylinder liner. This wear is thought to be due to lack of lubrication but this is a problem which has yet to be solved.



A 350 bhp diesel-electric shunting locomotive built in the Southern Region workshops. Tank capacity is 660 gal

One of the new Type 3 diesel electric locomotives in use on the Kent coast, mainly for freight traffic





This 1160 hp diesel-electric locomotive was built at Derby for the London Midland Region, but is now one of fifteen on loan to the Southern Region

A number of cases of loss of power resulted from a lack of fuel, and although there was no restriction in the fuel lines, fuel starvation was still present. Further examination showed the fuel pump delivery valve sealing washer to be tracking and allowing the fuel to escape back to the low pressure side of the pump. However, since all copper sealing washers are now annealed just prior to fitting, the difficulty has been largely overcome.

One serious engine failure has occurred on the multiple unit diesel trains. This was caused by water seeping from a porous cylinder head casting into the sump lubricating oil. Unfortunately, the leak occurred after some 3000 hours of service, and failure followed rapidly. The water caused the detergent oil to emulsify and severe corrosion of main and big-end bearings occurred, necessitating a complete replacement of all bearings and crankshaft. Unfortunately, failure was so rapid that the water was not detected until much of the damage had occurred, and it is debatable whether this engine could have been saved whatever method of checking was employed.

Maintenance

All units are fuelled and checked for lubricating oil and water daily and are given a brief examination for leaks. Major examinations are carried out at monthly intervals and are completed during a normal shift. They consist mainly of a visual examination of all parts and filter cleaning. At three-monthly examination, all injectors are changed, tappets checked, and a full visual examination of all internal and external parts is carried out.

Overhauls are carried out in a well-equipped shop at Eastleigh after 7000–8000 engine hours, *i.e.* about 200,000 miles. This is a top overhaul which entails removal of cylinder heads, pistons, big-end bearings, superchargers, etc., and results to date indicate a complete engine strip down with general overhaul to be unnecessary before some 20,000–25,000 hr, *i.e.* 600,000–800,000 miles.

The general condition of components after overhaul may be assessed as follows:—

Bearings: Good, except that odd ones show scoring.

Pistons: Carbon build up very small with negligible ring groove wear, but cracking has occurred at the piston where relieved for valve clearance.

Rings: Good. Top compression rings generally renewed. All other compression and oil control rings refitted in their original positions.
Liners: Good. Average maximum liner wear 0·003 in.
Crankshaft: Good. Negligible ovality recorded to date of 0·0005 in.
Crankshaft: Deflection—good 0·0005 in.
Valves: Wear on exhaust valve stems and guides heavy.

On completion of overhaul, the engine is run-in and tuned over a period of some 16 hours under varying load conditions from the initial period of "no load" to 4 hours on full load when final tuning is carried out. The engine is loaded electrically during the load running period, the energy being dissipated in the form of heat through suitable resistances, and the equipment is operated as near as possible under normal traction conditions.

Fuel Consumption

As an indication of the fuel consumption costs, etc., which are related to the diesel multiple unit trains of which we have considerable operating experience, the following may be of interest

Fuel consumption: 0·385lb bhp hr 0·42 gal mile engine 500 hp. 0·395lb bhp hp 0·54 gal mile engine 600 hp.
Lubricating oil consumption: 0·6 per cent of fuel for Hampshire 600 hp engines; 0·75 per cent of fuel for Hastings 500 hp engines. Including oil changes and topping-up figures.
Power utilization: Approximately 34 per cent.
Average speed: 30 mph.

These may seem relatively low figures, but for traction they are generally good. They are arrived at from actual service performance and it will be appreciated that the power utilization and average speed are drastically reduced when station stops, coasting periods, etc. are all taken into account. However, this should not be misconstrued to the extent of saying too much horsepower is installed and service speeds are slow as full horsepower is frequently required and running speeds are often between 70 and 80 mph.

★ ★ ★

Petroleum in Parliament

Methane Imports

In a written answer on 5 June, the Minister of Power said he could not yet give an estimate of the overall effect on coal consumption of the import of up to 1000 million cu ft year of Saharan gas as agreed upon in Paris by the Gas Council and the French producer companies. He said imported methane would displace some coal gas. It would also supplant some oil for gas making, and, as an enriching gas, enhance the value of lean gases produced from coal.

Oil Imports

Thirty-five per cent of the oil imported into the United Kingdom in 1960 was carried in ships flying the British flag. This information was given in a written answer from the Minister of Transport on 19 June.

Scottish Shale Oils

A Clause, moved by John Taylor (West Lothian), which would exempt shale oil mined in Scotland from excise duty, was defeated during the Committee stage of the Finance Bill on 20 June by 234 votes to 165.

Mr Taylor said that it was not possible to produce oil from shale in Britain at a cheaper cost than that of imported oil. Oil produced from shale must be sold at the same price as imported oil. He claimed that the industry was being strangled by the duty.

J. Hill (Midlothian) said that if the concession were granted, it would cost the Treasury about £600,000 a year. But if the industry were allowed to die, the cost to the Government would be very much more.

The Economic Secretary to the Treasury acknowledged the human and social problems which would be occasioned by a collapse of the industry. While he also recognized that it could not be kept going on anything like equal terms with imported oils, he said that it owed its continued existence to the duty preference accorded to its products.

Although the industry pays a tax of 1*s* 3*d* a gallon on its major products, this is collected from the public who buy them at prices which reflect a customs duty of 2*s* 6*d* a gallon on similar imported oils. In spite of the duty benefit, valued at £650,000, the industry lost some £225,000 last year and could not be called an economic proposition, he claimed.

The Stockholm Convention, which excludes any protection of a domestic product against EFTA products over those existing at the beginning of 1960, was given as another reason for rejecting the Clause. Under this agreement, there was an undertaking to eliminate all protective margins of preference by 1965, and consideration was being given as to whether other forms of assistance should be given to the industry.

Light Hydrocarbon Oils

A new Clause to the Finance Bill, which would permit the Treasury to grant relief from duty, in certain circumstances, in respect of light oils used as industrial raw materials, was rejected on 21 June by 256 votes to 183.

Geoffrey Stevens (Portsmouth, Langstone), who moved the adoption of the Clause, recalled that light hydrocarbon oils were used industrially in the manufacture of paints, linoleum, and rubber goods. No other country, he argued, imposed equivalent duties of 2*s* 6*d* a gallon on these oils.

While it was true that manufacturers could get a full rebate in respect of exports and the home trade was assisted by a protective tariff, he considered these measures inadequate and, in some instances, difficult to operate.

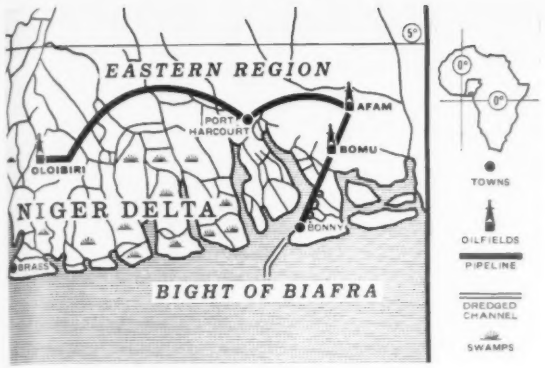
The motion was also supported by Harold Wilson (Huyton), Leonard Cleaver (Birmingham, Yardley), and Chuter Ede (South Shields).

The Economic Secretary to the Treasury said that he considered that a concession to industrial users of light oils would encourage other users of oils to seek concessions. If the Clause were adopted, it would cost £8 million in the current year, and if it were extended to others it could be £16 million or more a year. In view of the cost, he said that he could not support the Clause this year.

Energy Consumption

The Minister of Power told a questioner on 21 June that total inland energy consumption in the United Kingdom in 1960 was 264 million tons of coal equivalent compared with 245 million tons in 1959. The respective increases in the use of coal, oil, gas, and electricity were 4 per cent, 17 per cent, 4 per cent, and 13 per cent.

Total inland energy consumption in Scotland was 25 million tons of coal equivalent in 1960 compared with 23 million tons in 1959. The use of coal rose by 6 per cent, oil by 14 per cent, gas by 2 per cent, and electricity by 11 per cent.



Opening Up the Bonny River

New Channel Makes Nigerian Crude More Competitive

The recent passage of a tanker laden with 15,230 tons of crude oil through a newly-dredged experimental channel at the mouth of the Bonny River in Eastern Nigeria marks an important milestone in an effort to open up the river to bigger ships. The tanker's cargo was the largest ever shipped from a Nigerian port.

The Bonny, like most West African rivers, has a sandbar at its mouth, which limited the draught of ships using it to not more than 21 ft, and 18,000-ton tankers were unable to leave port fully loaded. They were half-loaded at a temporary terminal at Port Harcourt 40 miles from the sea, and topped up outside the bar from a small shuttle tanker kept in the Bonny River for the purpose. This proved not only costly and time-consuming, but a difficult operation when a strong swell was running.

International experts were called in to study the problems of deepening the entry to the Bonny River. An initial survey was made by the British Admiralty in 1954. Then marine experts in the Netherlands made detailed studies in the Shell laboratory at Delft.

It was ultimately decided that experimental dredging should be undertaken to a depth which would enable fully laden 18,000–20,000 ton tankers to leave the Bonny on the high of most tides, and eliminate the necessity for topping up.

The work, which began in 1959, was carried out by a British/Dutch firm, Costain-Blankevoort Dredging Co. Ltd, in conjunction with Raymond International of America. When the first phase of the dredging ended in February of this year, 5200 million cu yd of silt had been shifted at a cost of more than £1 million.

The new channel is 10,000 yd long and 520 ft wide at the bottom. The tanker which made the initial passage was loaded to a draught of 29 ft 9½ in, leaving 3½ ft clearance beneath her keel. The passage took 30 minutes.

If after 12 months the first phase appears to be successful, consideration will be given to deepening the channel to take still larger tankers.

New Tanker Terminal

The new Bonny oil terminal at Bonny Beach, together with adjacent installations, including the Bomu-Bonnu 12-in crude oil pipeline, were also recently completed. The project cost about £1½ million and took almost two years to finish.

The terminal, which lies just inside the bar, has a depth of water capable of accommodating the largest tankers currently foreseen and includes four storage tanks, three of which are of 110,000 barrels capacity, and one, a floating roof type, of 84,000 brl capacity. The pumps are capable of a loading rate of 1500 tons/hour.

The pipeline of 12-in dia, is 18½ miles long, and traverses dry land, swamp, and 10 miles of river bottom. It connects Bomu, at the moment the main gathering station in Nigeria of the Shell–BP Development Co. of Nigeria, with the terminal. At present crude oil is being pumped through it at the rate of 19,000 bd. This will be increased gradually during the year to 60,000 bd, representing a total annual production rate of 3 million tons.

The swelling stream of Nigeria's oil production has to compete with abundant supplies from other sources, some of them less difficult and costly to work in than the jungle and swamps of the Niger Delta. The opening of the Bonny River to larger and more economical tankers, therefore, holds the key to Nigeria's future place among the oil producing nations.

The dredger Vlaanderen XII *operating over the Bonny Bar, which restricts the entrance to the mouth of the Bonny River*

Personal Notes

G. H. W. Cullinan, deputy managing director of Shell Chemical Co. Ltd relinquished his executive duties recently, but is retaining his directorship and will continue to represent the Company on the Council of the Association of British Chemical Manufacturers and on various committees of the chemical industry and the Federation of British Industries.

Mr Cullinan joined Shell from Oxford in 1926 and served in the Middle East. From 1936 to 1939 he was manager of the Company's affairs in Palestine, later returning to Cairo to become general sales manager for the whole area. In 1944 he became general manager of the Shell Co. of East Africa Ltd. In 1946 he returned to the United Kingdom to become general manager, Technical Products Ltd, and when this became Shell Chemical Company in 1955 he was appointed commercial director and, later, deputy managing director.

M. Willcocks

M. Willcocks, O.B.E., F.Inst.Pet., has been appointed manager of the Shell refinery at Geelong in Australia.

Mr Wilcocks, who joined Shell in 1936, served as a technologist at the Company's Central Laboratories and at the Shell Haven and Heysham refineries, before going to Suez refinery in 1945 where he subsequently became assistant refinery manager and, in 1948, refinery manager. In 1952 he returned to the U.K. as assistant refinery manager at Shell Haven, becoming refinery manager at Heysham in 1954. In 1958, he was appointed manager of Shell Refining Co's Industrial Planning Department in London.

C. W. G. Martin, F.R.I.C., F.Inst.F., M.I.Mar.E., F.Inst.Pet., has retired from Shell International Petroleum Co. Ltd after over 40 years service. During most of this time, Mr Martin was concerned with fuel oils and allied products, and he has made many contributions on these subjects to various Institute publications.

A. T. Wright has retired from the position of director and manager of B.P.'s Tanker Insurance Co. Ltd. He had been with the Company since shortly after its formation in 1920. He has been succeeded as manager by **D. Southworth,** who was previously deputy manager.

G. Peters, B.Sc., F.Inst.Pet., recently became works manager at the Baglan Bay factory of British Hydrocarbon Chemicals Ltd. He had previously been head of the operations division of the Consortium at the Abadan refinery since 1955. Prior to this he was works manager for B.H.C. at Grangemouth, a position he took up on his return from Abadan in 1952.

R. G. Huxtable, M.B.E., is to be the new secretary of The Gas Council. On 1 August, he succeeded **Wilfrid Bailey,** who became deputy chairman of the Southern Gas Board.

Mr Huxtable has been secretary of the South Eastern Gas Board since 1956, and was previously the Board's solicitor. He was educated at Ilfracombe Grammar School and Wadham College, Oxford. He was admitted a solicitor in 1935.

Sir Ralph Metcalfe and **C. E. Steed** have joined the Board of Petrofina (Gt Britain) Ltd and **A. B. Stewart** has become secretary of the Company in place of Mr Steed.

The Rt Hon. Lord Baillieu, K.B.E., C.M.G., M.A., has been awarded the Gold Medal of the Institution of Mining and Metallurgy for 1960 in recognition of his distinguished services to the Commonwealth mining and metallurgical industries.

W. G. McKnight, Jr, was elected to the board of the Tidewater Oil Company recently. Mr McKnight is graduate of Harvard Law School and also holds directorships in a number of other companies.

Dr Heinz Heinemann has become manager of research and development for The M. W. Kellogg Company. Dr Heinemann has been with Kellogg's since 1957. Prior to that he was in charge of a research section at Houdry Process Corporation. He is a past president of the International Congress on Catalysis. He is the author of many patents and technical papers and received his Ph.D. in Chemistry from the University of Basel, Switzerland.

Karl F. Dallmus, now a consulting engineer in Venezuela, and **Lloyd E. Elkins,** production research director for Pan American Petroleum Corporation, have been awarded Distinguished Achievement Medals by the Colorado School of Mines.

Thomas D. Durrance has been elected vice-president—public relations of the Arabian American Oil Company in succession to **H. O. Thompson** who will serve the Company in a consulting capacity.

Mr Durrance, who joined Aramco in 1960 as manager of the Public Relations Department in the Middle East and will continue to be based in the Middle East, had previously served with Texaco Inc., as director of public relations.

H. R. Brooker, who was formerly general sales manager of Johnson, Matthey & Co. Ltd., has become a joint managing director of the Company.

Dr Henry B. Hass has been appointed director of chemical research by The M. W. Kellogg Company of New York. Dr Hass is a former head of the Department of Chemistry at Purdue University and manager of Research and Development for the General Aniline and Film Corporation.

Commodore J. F. Rumbellow, O.B.E., has retired and has been succeeded as Commodore of the Shell Tankers Ltd fleet by **Captain J. C. Nettleship,** who has been appointed to the 65,000-dw ton *Serenia*, the Company's new flagship, which has just entered service.

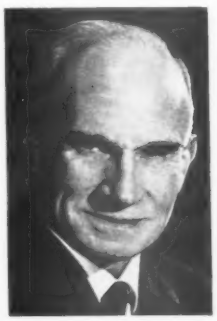
The new Commodore joined Shell in 1928 after 7 years at sea with the Wilson Line. He obtained his first command in 1940.

Commodore Rumbellow started his sea career in 1915 and was serving as an officer in the SS *Dockleaf* when this vessel was taken over by Shell in 1919. He secured his first command in 1927 and was appointed Commodore in 1955.

A. T. Wilford, B.Sc., A.R.C.S., F.R.I.C., C.I.Mech.E., F.Inst.Pet., London Transport's director of research, retired recently.

Mr Wilford was educated at Wilson's Grammar School, Camberwell, and obtained his degree at the Imperial College of Science and Technology.

He joined the former Underground Companies in 1920 as a chemist with the London General Omnibus Company and became chief chemist in 1926, a post which he continued to occupy under the London Passenger Transport Board. He became superintendent of laboratories when the laboratory services of the London Transport Executive were centralized in 1949, and in 1950 he was appointed to the new post of director of research.



A. T. Wilford

He served on a number of committees and for several years was a Member of Council of the Institute of Petroleum. He is the author of a number of papers concerning the use of fuels and lubricants in road service vehicles and for one of these he was awarded the Crompton-Lanchester Medal of the Institution of Mechanical Engineers.

Edward Littlejohn has been made manager of the headquarters Public Relations Department of Humble Oil & Refining Company. Mr. Littlejohn, who was born in Australia, spent a year at the University of Sydney before entering the London School of Economics from which he received a B.Sc. degree in 1938. Then followed a year as a lecturer in politics at the University of Sydney, before he entered Harvard University, where he obtained a master of arts degree in 1941. Before taking up his new appointment he was assistant manager of Jersey Standard's Public Relations Department.

R. F. Hockin, A.C.W.A., A.M.I.Mech.E., has resigned from the board of Burtonwood Engineering Co. Ltd to devote more time to his other interests.

W. Bamford and **B. E. Newman** have joined the Board of the Infra Red Development Co. Ltd. **J. B. Johnston** has been appointed secretary of the Company.

R. P. Hooper has taken over the newly-created position of manager, Product Supply Department of the Gulf Eastern Company. Mr Hooper was formerly manager, Product Supply Division, British American Oil Company, in Canada.

F. Murphy recently joined Metal & Pipeline Endurance Ltd as a senior cathodic protection engineer. He was previously technical director of Metal Economics (Seaguard) Ltd, and has also worked as a corrosion engineer for Shell in Venezuela.

A. J. Fox, assistant to sales manager of Tretolite Co., has been made sales manager for Petrolite Ltd, Eastern Hemisphere division, in England.

F. E. Collis has been appointed production director of the Perkins Group at Peterborough. Mr Collis, who took an external degree at London University, was previously chief production executive with the Plessey Company.

P. B. Binsted has become managing director of Gulf Oil Marine Agency, Belgium. Mr Binsted joined the Gulf Eastern Company in 1957 for chartering duties and, before his transfer to Antwerp, was co-ordinator of operations of Transportation Department.

J. O. H. Bowman, for some years head of the Austin Motor Co. Ltd's press and public relations department, has been appointed general public relations manager, with specific overseas P.R. responsibilities, in the newly established Perkins Group Public Relations Department. **Peter Hooper**, who has been press relations officer of the Group for the past seven years, has been promoted group press relations manager and also appointed U.K. public relations manager.

S. H. Ireland has been appointed assistant managing director of Consolidated Pneumatic Tool Co. Ltd. **L. S. Bright** has become a financial director and **A. O. Miller** a director.

Dr Albert W. Musgrave, superintendent of special geophysics problems for Mobil Oil Company, has become the third recipient of the Colorado School of Mines van Diest Gold Medal, which was established in 1950 to be awarded to graduates who perform outstanding achievements within 5 to 15 years after completing their studies.

After graduation in 1947, Dr Musgrave worked as a seismologist for Mobil before returning to the School for doctoral studies in 1950. While a doctoral candidate he formulated and designed the Raypath Plotter, a pioneering analogue computer designed for use with seismic reflection interpretation.

Neil W. Mann has resigned as vice-president in charge of the United States and Canadian operations of Geophysical Service Inc. after 27 years with the Company, and **Richard H. Rainey** has been appointed manager of U.S. and Canadian operations. Prior to taking up his new appointment, Mr Rainey was assistant to the vice-president, Eastern Hemisphere.

Charles A. Moore has been appointed to the board of U.S. Industries Inc. (Great Britain) Ltd. He is already a director of Burtonwood Engineering and chairman of the board and principal sales executive of Manning, Maxwell, and Moore Inc. in the United States.

Another American appointment to U.S. Industries Inc (Great Britain) Ltd is that of **C. M. Peters**, who has been appointed manager of the Oilfield Division. Mr Peters was previously chief engineer and vice-president of engineering of the Garrett Oil Tools Division of U.S. Industries Inc.

C. M. Peters

Norman Readman, managing director of the Consolidated Pneumatic Tool Co. Ltd in London, will be leaving for New York in September to become president of the Chicago Pneumatic Tool Co.

Mr Readman joined Consolidated Pneumatic in 1943 and was appointed a director in 1947. He became managing director 6 years later and was appointed a director of the American company last year.

Regent's New Terminal at Granton

Fully Operative after only 14 months Construction Work

The Regent Oil Company's new terminal at Granton, which cost over £500,000 to build, provides storage for over 8 million gal of products. It is the fifth installation of its kind to be completed by the Company in the past 18 months and replaces storage facilities at Grangemouth.

The 16-acre site, leased from Granton Harbour Ltd, is on rising ground overlooking the Forth opposite the harbour's West Pier. The terminal will supply company depots in Glasgow, Ayr, and Dundee, and dealers within a 50-mile radius.

It is served by ocean tankers from Trinidad and Bahrain. The West Pier provides berthing for one tanker of up to 18,000 tons, with a maximum draught of 20 ft. Products are off-loaded by Emco marine unloaders and are pumped ashore through 10-in and 12-in diameter docklines, each between 4000 ft and 5000 ft long, at rates up to 2000 gal/min. Limited space on the pier made it necessary to install the light oil lines within the pier masonry and to place the fuel oil lines one above the other on the inside face of the sea wall.

There are two types of storage housing over 6 million gal of motor spirits, gas oils, and kerosines, and 2 million gal of fuel oil.

The ms Texaco Oslo *arriving at Granton harbour with the first cargo of light oils. With a summer deadweight of* 18,810 *tons, she is the largest tanker ever to have discharged in Granton Harbour*

Light Oil

The light oil facilities comprise fourteen vertical and eight horizontal tanks accommodating three grades each of motor spirit and kerosine and two grades of gas oil. The light oil docklines inside the terminal run above ground into a selective manifold where the products are segregated into their own pipe system.

Light products are passed from the storage into road vehicles and railcars by four Mather and Platt centrifugal pumps operating at 600 gal/min and four more operating at 300 gal/min. The road tanker loading rack for light products has eighteen filling points and has six loading bays, but there is provision for expansion.

All road tanker loading is recorded by a Gilbarco meter at each loading point. The meters carry a ticket printing head to provide an automatic record of the load, and have a recently developed air stopping valve to

safeguard against any entrained air upsetting their accuracy.

Three Drum Engineering off-loading pumps working at the rate of 200 gal min are available for pumping off the contents of road tankers as required. Delivery from these pumps is also made through Gilbarco meters with ticket printing heads.

Fuel Oil

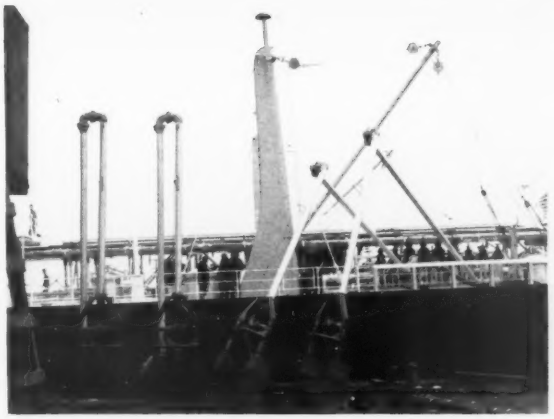
Three grades of fuel oil are stored at Granton in six vertical tanks, all of which are steam heated with internal heaters manufactured by Brown Fintubes (G.B.) Ltd. Both the heavy and medium oil tanks are insulated with glass fibre and clad with corrugated aluminium sheeting. The heat is generated by two Thompson Wilson boilers raising steam pressure at 4000 lb hr. The internal fuel oil pipe work and pipelines from the tanker pier are electrically heated and are also insulated with glass fibre and aluminium.

Drum Engineering pumps are used for all fuel oil movement, two pumps of 330 gal min being allocated to each of the three fuel oils. The pumps are remote controlled from the road or rail loading racks and are linked up through a differential pressure system which automatically calls into action one or two pumps in accordance with the demand from the loading racks. Delivery into road or rail tankers is by 4-in articulated Emco loading arms.

Layout

The loading yard is approached from the harbour road up a 100-yd slope, below the surface of which have been placed electrically heated mats similar to those installed under the Mound in Edinburgh, to prevent icing during winter months.

The main buildings are constructed of brick and were designed by the Company's Engineering Department in conjunction with the Edinburgh Corporation Planning and Architects Departments. They consist of an office and general amenities block containing messrooms, clothes drying and personal locker rooms, vehicle servicing and washing bays, general stores, and a small laboratory. There is a large warehouse for storing and handling lubricating oils and greases in packages from 1 pint cans to 40-gal barrels. A double-track rail siding extends into the terminal alongside which a rack has been built to provide for the loading of six railcars simultaneously. Railcars are moved inside the installation by electrically driven capstans. All main operating points of the terminal are inter-connected by an automatic internal telephone system. Owing to the position of the site, it was necessary to provide a 6-in diameter water main to supply the hydrant points for fire fighting. At each storage tank there are foam pourers and drenchers.



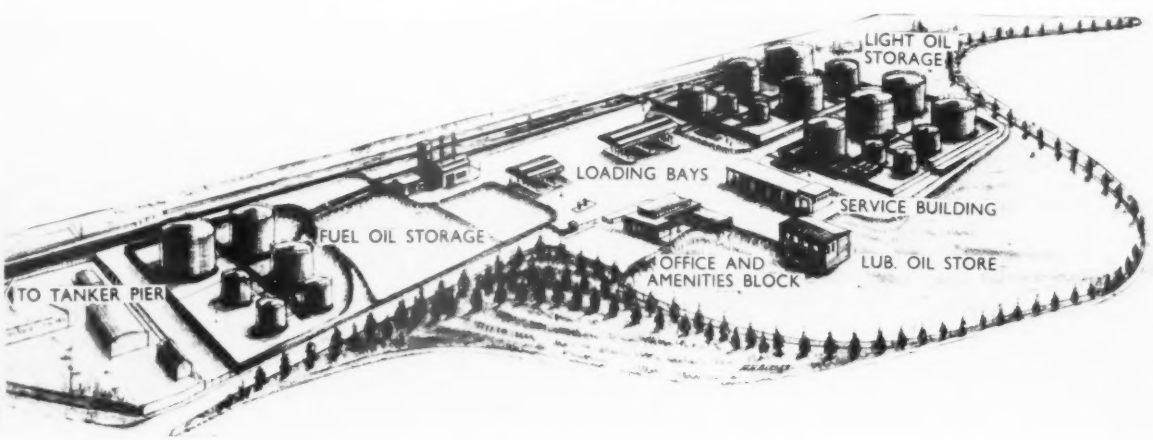
Emco *marine unloaders in operation when the ms* Texaco Oslo *discharged the first cargo of light oils to arrive at the terminal*

Detailed design and construction was carried out to Regent's specification by James Laidlaw and Sons, Ltd. Storage tanks were supplied and erected by Redhough Iron & Steel Co. Ltd and tank fittings were supplied by Whessoe Ltd.

Among other sub-contractors were:

Dock lines	Thomas Tannahill & Son Ltd and Wm. Press & Sons Ltd.
Fuel oil pipework	Sears Pipework Installations Ltd.
Light oil pipework	Munro & Miller.
Tank and pipeline insulation ...	Miller Insulation & Engineering Co. Ltd.
Structural steelwork	Wm. Bain & Co. Ltd.

The drawing shows the layout of the terminal. The light oil storage tanks have a capacity of over 6 million gal, while the fuel oil storage tanks house 2 million gal of products

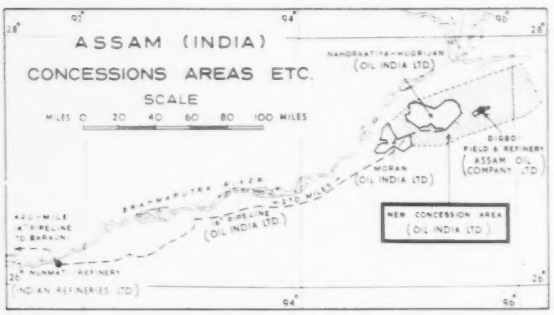


Notes of the Month

New Agreement Between BOC and Indian Government

Under a new agreement, which preceded the grant of some 1800 sq miles for further oil prospecting in north-east Assam, the Burmah Oil Company and the Indian Government are to put their partnership in Oil India Ltd on an equal footing.

To do this BOC, which owns two thirds of the Company, is to sell 16⅔ per cent of its share to the Government at par. This will give both parties a 50 per cent holding in the Company.



The new territory largely surrounds existing concessions held by Oil India Ltd at Nahorkatiya-Hugrijan and Moran, and by Assam Oil Co. Ltd at Digboi

The terms of the agreement also provide for BOC to accept the obligation to provide foreign exchange for development of any oil found as a result of new exploration and for the Government to accept responsibility for providing rupee finance.

Crude oil produced by the Company will be sold to the Government owned Indian Refineries Ltd and BOC's subsidiary, the Assam Oil Company. The price of the oil sold to Indian Refineries will be subject to an agreed discount calculated on Persian Gulf fob prices for crude of equivalent quality.

Both partners will nominate four members to the eight man board. The chairman will be appointed in alternative years by the Government and BOC. The managing director will be selected by the partners from a panel submitted by BOC and the finance director from a panel submitted by the Government.

Other main points from the agreement provide for Oil India Ltd's past and present expenditure on exploration and development to be deductible for tax and for an immediate exploration programme to begin. The parties also agreed that the Company should be in a position from each calendar year from 1962 to pay a dividend free of all taxes, including tax deducted on dividends, of not less than 9 per cent and not more than 13 per cent on equity capital.

NIOC's Reorganization Programme

Phase one of the major reorganization programme of the National Iranian Oil Company, which followed the enacting into law of its new Constitution in 1960, has now been completed with the publication of a detailed definition of its responsibilities and working relationships.

Under the new Constitution NIOC is responsible for:—

Exploration, exploitation, and production of crude oil and natural gas.
Refining and processing of crude oil and natural gas.
Distribution and sale of crude and finished products inside and outside Iran.
Participation in joint companies for exploration, production, processing, distribution and sale of crude, natural gas, finished and by-products.
Safeguarding Iran's legal and financial interests in all matters related to the oil industry.
Supervision of associated, affiliated, and independent oil companies in Iran including: Use and protection of assets and installations belonging to Iran; supervision of oil account and oil payment; enforcing conservation and good oil practices; and ensuring training and developing of Iranian employees.
Operating the "non-basic" services in the Agreement Area under terms of the Oil Agreement with the Operating Companies.

The second phase of the reorganization programme includes the completion and implementation of detailed organization and manpower studies and the institution of cost reduction surveys.

The programme is being directed personally by NIOC's chairman, A. Entezam, who also holds the recently created position of general managing directer. Under the new Constitution this post carries broad powers of reorganization and authority to determine delegation of his overall responsibilities to subordinate units of the Company.

Major New Gas Field in South Louisiana

Production tests on a Tidewater Oil Company wildcat well have indicated discovery of major new South Louisiana natural gas reserves in the Hollywood Field. The well, Southdown No 12, drilled to a total depth of 16,588 ft, has an indicated 517 net ft of producing formation from 13 gas-bearing sands. Three sands with 147 net ft of pay formation are deeper than any previously discovered in the Hollywood Field.

During a 6-hour production test of the deepest sand, through perforations in the 16,462–16,672 ft interval, the well flowed at a rate of 3200 M cu ft of gas and 117 bd of 48 gravity condensate through a 9/64-in choke. Flowing tubing pressure was 9710 psi, with a gas/oil ratio of 28,430/1. After being shut in for 30 mins, the wellhead pressure increased to 11,920 psi.

The Hollywood Field was originally discovered in 1953 and was already considered one of Louisiana's major gas condensate fields prior to the discovery of the new zones. During 1960 the field produced over 18,000 million cu ft of natural gas and 317,000 barrels of liquids.

In addition to the three new deep sands, the remaining ten sands penetrated by the well include four probable new reservoirs with 117 net ft, according to electric log surveys, and six sands with 253 net ft which have previously proven productive in the field.

Airborne Oil Exploration in S.W. Africa

An airborne magnetometer survey of one of Africa's largest game reserves is to be made shortly. The area, known as the Etoshapan, covers some 40,000 sq miles and lies near the Angola border in South West Africa.

It has never been mapped in detail before, but a Marconi Doppler Navigator, an airborne radar aid, will enable the aircrew making the study to fly and record an accurate grid without incurring the expense of ground installations.

The Etosha Petroleum Co., which holds the concession for the area, is a subsidiary of the Texas Eastern Transmission Corp. The survey work will be carried out on their behalf by Hunting Surveys Ltd.

The new coastal tanker Alfaris *will carry products for BP (Eastern Agencies) Ltd from the Sharjah installation to other points along the Trucial Coast and Oman territories. The vessel can carry* 250 *tons of products. Her equipment includes two* 600-*ft delivery hoses which can be run out over the bow of the ship to the shore. The vessel was built by James W. Cooke & Co. of Wivenhoe, Essex, for the Dilmun Navigation Company, who are chartering her to BP*

Ahwaz Field's Second Producer

The Iranian Oil Exploration and Producing Company announced recently that Ahwaz Well No 8 came into production early in May, at a rate of about 26,000 bd. This is the second well to come into production in the new Ahwaz Field. The first, Ahwaz No 6 is currently producing some 6800 bd of crude.

Varga Cracking Process for the West

The patent of the hydrocracking process developed by Dr Jozef Varga in Hungary is being offered for sale in Western countries after what are claimed as successful tests on Soviet oil over the past two years.

The Varga process is said to make possible the economical processing of crude oil and residues using relatively little hydrogen and only medium pressure. According to one Hungarian newspaper, companies in France, U.S.A., West Germany, Brazil, Sweden, and Switzerland have already expressed an interest in acquiring the patent.

Extensions at U.S. Refinery

Work has just started on a new £7 million *Iso*cracking plant at the Tidewater Oil Co's Avon Refinery, which is sited in the San Francisco Bay area. It will include a catalytic pre-treater unit and an *Iso*cracking unit, each of 20,000 bd capacity, plus a 50 million cu ft/day hydrogen generating plant.

The plant will be the first of its type on the U.S. West Coast.

New U.S. Nitrogen Fertilizer Plant

What will be the largest nitrogen fertilizer complex in the United States is now under construction in Cherokee, Alabama. It will cover some 1200 acres and include six different plants capable of manufacturing 1700 tons/day of products.

The project is being financed by the town of Cherokee, and represents an investment of nearly £9 million. One of the principal contractors, The M. W. Kellogg Company, estimates that over 15,000 yards of concrete and more than 5000 tons of structural and reinforcing steel will be used during construction.

The complex is expected to be completed in 1962 and it will then be leased to the Armour Agricultural Chemical Company. Water and natural gas will form the chief sources of power for the various plants, and the major products will be ammonia, urea, nitrogen solutions, nitric acid, ammonium nitrate, and ammonium phosphate.

Record Australian Exports of Refined Products

For the first time, Australian exports of refined petroleum products last year exceeded the volume of imports of refined products. Exports were valued at nearly £A22 million compared with £A15½ million for exports in 1959, while imports of 1·4 million tons of petroleum products in 1960 were 5 per cent lower than imports in 1959.

Australia's refining industry has, in a decade, developed from an industry barely able to supply 14 per cent of the country's requirements of petroleum products to one of the nation's most important industries meeting 90 per cent of its requirements.

Although the pattern of refining is such that Australia still has to import some petroleum products, the quantity is dwindling steadily.

The Commonwealth's refining industry is reported by PIB (Australia) Ltd to be planning to spend at least £A80 million in the next few years on construction of new refineries and additions to existing plant. Already scheduled is the construction of a new Standard-Vacuum refinery at Hallett's Cove, South Australia and a refinery near Brisbane for Amoco Australia Pty. Ltd.

Additionally, a new lubricating oil refinery is already under construction adjacent to the Kurnell refinery, Sydney, for Australian Lubricating Oil Refinery Ltd and plans have been announced for two other lubricants plants, one at the Kwinana (W.A.) refinery for BP and the other at Shell's Geelong (Victoria) refinery.

Other major expansion works planned or under construction include additions costing £A12 million to lift the capacity of A.O.R.'s Kurnell refinery from 2·3 million tons to 3·8 million tons/year, construction of a £A17 million catalytic cracking unit at Shell's Clyde (N.S.W.) refinery, and a £A2 million catalytic cracker for BORAL's Matraville (N.S.W.) refinery.

Italy's largest service station is also its most unusual. Known as the "Bridge of Cantagallo", it is situated on the Autostrada del Sole near Bologna. There are complete service areas on either side of the road, and the building incorporates a restaurant, a snack bar, and a pastry shop. For good measure, it also houses an agency of the Banca Commerciale Italiana, a tourist agency, a post and telegraph office, a flower shop, a bookshop and newspaper stand, and a souvenir shop. There is also parking space for 300 *vehicles*

Singapore's First Refinery Completed

The Shell refinery on Pulau Bukom, the first refinery in Singapore, was completed at the end of June and inaugurated by Dr Goh Keng Swee, Minister for Finance in the Singapore Government, on 26 July.

Designed to process 1 million tons/year of crude oil, the refinery will meet Shell's local requirements of the principal petroleum products, such as motor spirit, aviation turbine fuel, kerosine, gas oil, diesel fuel, and fuel oil.

The building of the refinery involved the removal of a hill and the excavation of 500,000 tons of earth which was used to reclaim 25 acres of new land from the sea. The agreement for the construction of the refinery was signed with the Singapore Government in March 1960. The foundations were started in September last and the erection of the plant itself was begun in December.

U.S. Company's Big Investment Programme

An intensive six-year building programme involving a capital expenditure of over £3 million has taken the Tidewater Oil Company from fourteenth place in the U.S. oil industry to eleventh place.

In a recent speech to shareholders, the Company's president, George F. Getty II, said that a further £1½ million would be spent on expansion over the next five years.

Since 1954 the Company has increased its oil reserves by 25 per cent and its natural gas reserves by 61 per cent. Gasoline sales have risen by 29 per cent and sales of natural gas have increased by 53 per cent.

New Phthalic Anhydride Plant for Hull

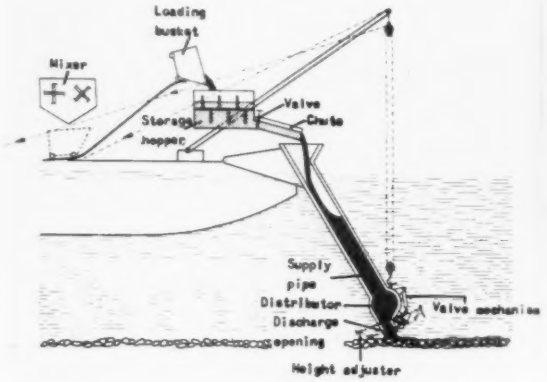
The new Grange Chemicals Ltd plant for the manufacture of about 15,000 tons/year of phthalic anhydride, announced recently, will be built at Hull on a site adjacent to the Salt End Chemical Works of The Distillers Co. Ltd's Chemical Division, who will operate the plant on behalf of Grange.

The contract for the plant, which is expected to be commissioned during the second half of 1962, has been placed with Badger Ltd.

The new 45,000*-ton P. & O. liner* Canberra *requires twenty three different grades of lubricating oil for her extensive range of machinery. In our photograph, she is seen taking on over* 4000 *tons of fuel oil and a small amount of lube oil from the BP International Bunkering Service installation at Aden on her maiden voyage. The* Canberra *can carry* 2400 *passengers in air-conditioned luxury*

New Machine Lays Asphalt Under Water

A new machine which lays a carpet of asphalt under water has been developed by engineers of the Royal Dutch/Shell laboratories in Amsterdam in an effort to simplify the closing of dams across estuaries or rivers.



A diagrammatic representation of the new technique

As the two parts of a dam approach each other, the construction materials put in to close the gap are often washed away by the increasing speed of the current as it forces its way through the narrowing outlet. This difficulty is overcome by sinking large caissons to act as a seal, but the problem has always been to provide a firm foundation on which they could rest. The large flexible mattresses or fascines loaded with stones, which have previously been used for this purpose, were not only costly to lay but also had a short life.

Now it looks as if a layer of asphaltic mixture, or sand mastic, may provide the answer. The laying apparatus is mounted on a barge and consists of a supply pipe which feeds the mastic, which must be at a temperature in the neighbourhood of 100°C, to a horizontal distribution cylinder. This cylinder has a number of specially designed apertures through which the mixture emerges in individual jets that flow together on the bottom to form strips up to 17 ft in width. The thickness of the asphalt carpet depends on the capacity of the mixer supplying the mastic and the speed of the vessel on which the applicator is mounted.

The apparatus has been successfully tested in depths of 24 ft and in water flowing at 5 ft/sec, and it is currently undergoing trials in 50–60 ft of water.

Incursions into the Plastics Field

From both Mobil and Castrol there is news of incursions into the plastics field.

Mobil Holdings Ltd has made a £6·8 million bid for O. & M. Kleeman Ltd, who manufacture plastic goods. The offer is for the whole of the Company's ordinary and preference capital stock. If it is successful, Derrick Kleeman will continue as chairman of the firm of which his father was one of the founders.

Castrol Ltd has acquired 75 per cent of the share capital of Melwood Thermoplastics Ltd of Harpenden, and the entire share capital of Tensile Products Ltd.

Melwood Thermoplastics Ltd manufactures high-grade thermoplastic extrusions and is currently extending its production facilities. Tensile Products Ltd produces plastic fabrication and provides a finishing service for the customers of Melwood Thermoplastics.

James Readdie, a deputy at Scottish Oils Ltd's No 1 shale mine, Philpstoun, receiving his British Empire Medal, awarded in the 1961 New Year Honours List, from the Minister of Power in London recently. Mr Readdie started work at the age of 14 in one of the early shale mines belonging to Young's Paraffin Light and Mineral Oil Company, and has worked continuously with Scottish Oils ever since, completing 51 years service. He has served as captain of the Mine Rescue Training Brigade, and in 1948 was awarded the gold medal for rescue work given by the governors of Heriot Watt College, Edinburgh

G.E.C. Enters Process Control Field with U.S. Company

The latest example of Anglo-American industrial co-operation is provided by G.E.C. and Thompson Ramo Wooldridge Inc. of Los Angeles. The two firms have formed a joint company, International Systems Co. Ltd, which will be based in Britain and market process control systems in the U.K., the Commonwealth, and the European Free Trade Area.

The American company introduced the first ever computer designed specifically for the completely automatic control of industrial processes in 1957. Designated the RW-300 Digital Control Computer, it will form the basis of the control systems offered by the new joint company. Under the agreement it will be manufactured at a G.E.C. factory in Coventry.

Thompson Ramo Woodridge has already installed thirty process control systems incorporating the RW-300 computer in the United States and Europe with over 99 per cent reliability in round the clock operations.

Although the new Company's initial capital of £430,000 is jointly shared by the two parents, day to day management will be under British control. G.E.C. is providing the chairman and managing director, O. W. Humphreys and Dr D. N. Truscott, and a non-executive director, W. A. C. Maskell. The American company will be represented on the board by Dr E. M. Grabbe, who will be deputy managing director, and two non-executive directors, G. W. Fenimore and M. E. Mohr, who are both vice-presidents within the TRW group.

Gas Turbine Power Station at Nahorkatiya

India's first gas turbine power station is now in operation in the new Oil India township at Nahorkatiya, where it is supplying power for oilfield and industrial operations, as well as for domestic areas.

When completed the station will comprise three sets of Zaloni gas turbines of 1790 kW each. So far only one set is in operation, but the second set has already started testing and the third is already on its way to Calcutta.

The turbines will operate on natural gas produced from the Nahorkatiya oilfield. Apart from the obvious economic advantage in this particular instance, natural gas is an ideal fuel for industrial gas turbines because it does not create any undesirable ash products.

Max Hecht Award for Gulf Oil Technologist

Claude K. Rice, who is Analytical and Testing Section Co-ordinator for the Technology Laboratory at Gulf Oil Corporation's Philadelphia refinery, was presented recently with the 8th Max Hecht Award by the American Society for Testing Materials' Committee D-19 on Industrial Water. The award is made each year to a member of the ASTM Committee D-19 who has performed some outstanding work in the committee or in the fields of industrial water.

Mr Rice received the award, a tribute to his prominent service to the field of water technology and as a Standards Adviser for the committee, and in recognition of his work in the development of uniform systems for writing specifications and test methods. He has served as Standards Adviser to Committee D-19 since the creation of that office in 1950, and has been a member of ASTM since 1948.

In 1959 he received the ASTM Award of Merit for distinguished service to the society.

Tanker Company's Expenditure

During 1960, BP Tanker Company spent £2,530,000 in the United Kingdom on ships' stores, including provisions, paint, and machinery. In the same period purchases in foreign ports cost a further £425,000.

In announcing the figures, the Company said that the biggest portion of the amount spent in the United Kingdom was the £766,000 expended on machinery. Some £361,000 was spent on paint, £144,000 on ropes, and £650,000 on general stores. Fresh provisions accounted for £301,000 and dry provisions for £308,000.

Expenditure in foreign ports included £346,000 on provisions.

★ ★ ★

HONOURED BY THE QUEEN

We are happy to record the following appointments which were among those made by H.M. The Queen on the occasion of her birthday:

Sir Harold Snow

KNIGHT BACHELOR

Harold Ernest Snow, C.B.E., M. Inst. Pet., a deputy chairman and managing director, The British Petroleum Co. Ltd.

B.E.M.

Stanley Ramsey, chief steward, tanker *Methane Pioneer*, General Service, Stephenson Clarke Ltd.

George Edward Wraith, pumpman, SS *San Ernesto*, Shell Tankers Ltd.

Esso Marine Terminal, Fawley

By **Captain J. H. DREW, O.B.E.***

Many refinery and crude oil loading terminals have been constructed during the past decade, each incorporating design modifications and improvements based on the operating experience of its predecessors and the post-war development of supertankers. While the changed pattern of crude oil movements to Western European refineries located adjacent to deepwater facilities has enabled the supertanker to achieve lower cost transportation of the crude oil to the refineries, the investment and maintenance costs of the terminal facilities needed to accommodate these large tankers is, to some extent, a debit against the savings achieved.

The trend towards supertankers for transporting cargoes of crude and residual oils has not diminished the demand for the smaller tankers for transporting the finished products from the refineries to the consumer areas, where, for economic reasons, it is impracticable to adapt the smaller ports and terminals to accept larger tankers.

The following technical description shows how these factors have influenced the development of Esso's tanker terminal at Fawley, built in 1950 and 1951 and extended in 1958.

An aerial view of the marine terminal and refinery. The 4200 *ft long jetty can handle tankers exceeding* 65,000 *dw tons*

Tanker Dimensional Characteristics

Tables I and II detail the more important dimensional characteristics needed by consulting, civil, and mechanical engineers concerned with the design and construction of jetty facilities, *e.g.* wind and berthing impact loads, cargo pump capacities, location of tanker manifold connexions, and vessels' freeboard in both the light and loaded condition.

Impact loads are important, since the kinetic energy of a vessel when it first makes contact with a jetty structure when berthing is calculated from the formula:—

$\frac{wv^2}{2g}$ Where w = vessel displacement in tons, v = velocity of approach, and g = acceleration of gravity.

As the kinetic energy varies as the square of the approach velocity, minor increases and decreases in the vessel's approach speed when berthing are very important, having regard for the stability and strength of the jetty structures and the energy absorption value of the resilient fendering installed on the face of the jetty. Formerly, jetty or dock structures were designed to absorb all the berthing impact load, whereas modern engineering research has found that the maximum shock loads to the jetty structures are approximately 40 per cent to 50 per cent of the kinetic energy, since the vessel itself absorbs a percentage of the load.

Observations and experience of berthing tankers of various sizes during the past few years has revealed that, provided the vessel is adequately assisted by tugs, the larger the vessel the easier it is to reduce her approach speed at the moment of impact, whereas the smaller vessels, unassisted by tugs, tend to approach the jetty or berth at higher approach speeds as shown in Table I. In exposed locations, wind loads imposed on the vessel's hull and superstructure when secured to the jetty in light draft condition frequently takes precedence over impact load considerations when preparing jetty design specifications.

The Esso Marine Terminal, Fawley

The large increase in petroleum shipments to and from Southampton since the end of World War II is mainly due to the increased number of petroleum shipments to and from the Esso Refinery at Fawley, which commenced when the T2 tanker *Esso Fawley* berthed at the new No 1 Esso marine terminal berth with the first cargo of crude oil for the refinery in August 1951.

The decision to build the refinery and marine terminal at Fawley was, to some extent, prompted by the fact that the company already owned and operated a small refinery and tanker jetty at Fawley and that additional land with suitable waterside frontage was available for construction of the new refinery adjacent to the existing facilities. The primary consideration was the provision of adequate marine facilities for servicing the new refinery, which was initially designed for processing a crude oil throughput of approximately 110,500 bd. It was estimated that at least one large ocean tanker would discharge a full cargo of crude oil every day, and numerous other ocean tankers, coasters, and barges would be constantly leaving with cargoes of finished products.

Conservancy Features—Fawley and Southampton Water

The refinery and marine terminal are located on the western shore of Southampton Water approximately 4 nautical miles from Southampton Town Quay, and 21 and 18 nautical miles respectively from the English Channel approaches to Southampton Water via the "Nab" and "Needles" channels at the eastern and western extremities of the Isle of Wight.

Southampton Water combines favourable conservancy features with natural deep and sheltered approaches since the Isle of Wight provides a natural breakwater, shielding Southampton Water from the Channel gales, and includes sheltered anchorages for deep drafted tankers waiting berth or undergoing repairs, within a reasonable distance of the

*Head of Port Facilities Section, Marine Department, Esso Petroleum Co. Ltd.

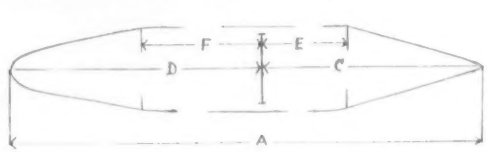
Table I

DIMENSIONAL CHARACTERISTICS—330 TO 12,000-DW TON TANKERS

Dw tons summer L/L	330	539	840	1046	1300	2630	2789	3470	4190	5143	5374	9220	10,310	12,130
Displacement summer L/L	640	870	1553	1600	1895	4040	4249	5380	6800	7513	7858	13,016	15,248	16,800
T.P.I. ,, ,, ...	6·1	10·0	11·4	12·8	14·0	22·9	23·6	27·2	29·7	32·7	46·5	47·6	54·6	57·9
Draft ,, ,, ...	10 ft 0 in	8 ft 6 in	13 ft 2 in	11 ft 11½ in	12 ft 9½ in	17 ft 1¼ in	17 ft 4 in	18 ft 10½ in	20 ft 2½ in	22 ft 0 in	15 ft 1½ in	25 ft 6½ in	26 ft 4 in	27 ft 1½ in
Length A	132½ ft	168 ft	202½ ft	196 ft	208 ft	282 ft	299 ft	310 ft	344½ ft	357½ ft	366 ft	446 ft	469½ ft	479 ft
Beam B	24 ft	32½ ft	30½ ft	33 ft	34 ft	41½ ft	42 ft	45 ft	48½ ft	48 ft	60 ft	54½ ft	61½ ft	61 ft
C	77 ft	71 ft	55 ft	84 ft	88/115 ft	120 ft	145 ft	140 ft	170 ft	162 ft	150 ft	236 ft	220 ft	255/123 ft
D	55½ ft	97 ft	147½ ft	112 ft	120 ft	162 ft	154 ft	270 ft	175 ft	195½ ft	215 ft	210 ft	249½ ft	224 ft
E	40 ft	27 ft	—	52 ft	54 ft	54 ft	64 ft	56 ft	53 ft	64 ft	101 ft	116 ft	83 ft	127 ft
F	23 ft	56 ft	—	63 ft	69 ft	80 ft	68 ft	88 ft	87 ft	43 ft	133 ft	42 ft	90f t	80 ft
Freeboard S. L/L G	9 in	3 ft 2 in	1 ft 0 in	1 ft 7 in	1 ft 9 in	9 in	3 ft 6 in	1 ft 1 in	2 ft 3 in	8 ft 6 in	2 ft 4 in	6 ft 0 in	6 ft 1 in	6 ft 5 in
,, L. L/L H	5 ft 7 in	7 ft 10 in	7 ft 4 in	8 ft 7 in	10 ft 0 in	11 ft 10 in	13 ft 10 in	12 ft 4 in	15 ft 3 in	22 ft 0 in	12 ft 2 in	23 ft 0 in	23 ft 2 in	25 ft 0 in
Manifold/deck K	1 ft 3 in	4 ft 0 in	5 ft 3 in	1 ft 6 in	2 ft 0 in	11 ft 0 in	2 ft 6 in	9 ft 0 in	2 ft 0 in	1 ft 3 in	9 ft 0 in	2 ft 0 in	2 ft 3 in	2 ft 6 in
,, /side L	7 ft 6 in	5 ft 0 in	10 ft 0 in	10P 19S	10P 21S	5 ft 3 in	10 ft 0 in	5 ft 9 in	8 ft 0 in	14 ft 0 in	16 ft 0 in	14 ft 0 in	20 ft 0 in	13 ft 3 in
Lightship area (sq ft)	1754	1822	3985	2895	3644	7070	7170	7240	9640	12,000	8414	18,000	16,250	16,950
*Wind thrust approx:														
30 m.p.h. (tons)	2	2	5	4	5	9	9	9	13	15	11	23	21	22
50 m.p.h. ,, ...	6	7	14	10	13	26	26	26	35	43	30	65	59	61
70 m.p.h. ,, ...	12	13	28	20	26	50	51	51	68	85	60	128	115	120
†Impact load at 24 ft/min	·8	1·1	1·9	2·0	2·3	5·0	5·3	6·7	8·4	9·3	9·8	16·1	18·9	20·9
Cargo pumps	2	2	2	2	2	2	2	2	2	2	2	4	8	4
T.P.H. water each	50	175	100	280	250	500	125	500	300	250	350	191	100	270
P.S.I.	—	—	—	110	110	—	—	—	—	100	—	—	—	—
Hose connexions No.	2	2	1 or 2	2 or 1	2 or 1	2	2	2	—	4	3	8	8	4
Sizes ins	8	8	4, 6 or 7	8 or 10	8 or 10	8 or 10	8 or 10	8 or 10	—	10	8 or 10	8	8	8 or 10

* Beam wind and shape coefficient 1·6 assumed. Formula used $P = \cdot 004(\cdot 9V)^2$ from E.R.E.C., Linden, N.J.

† Calculated for half-mass.



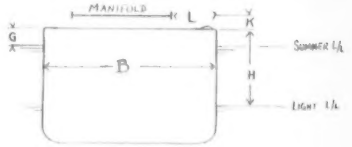


Table II

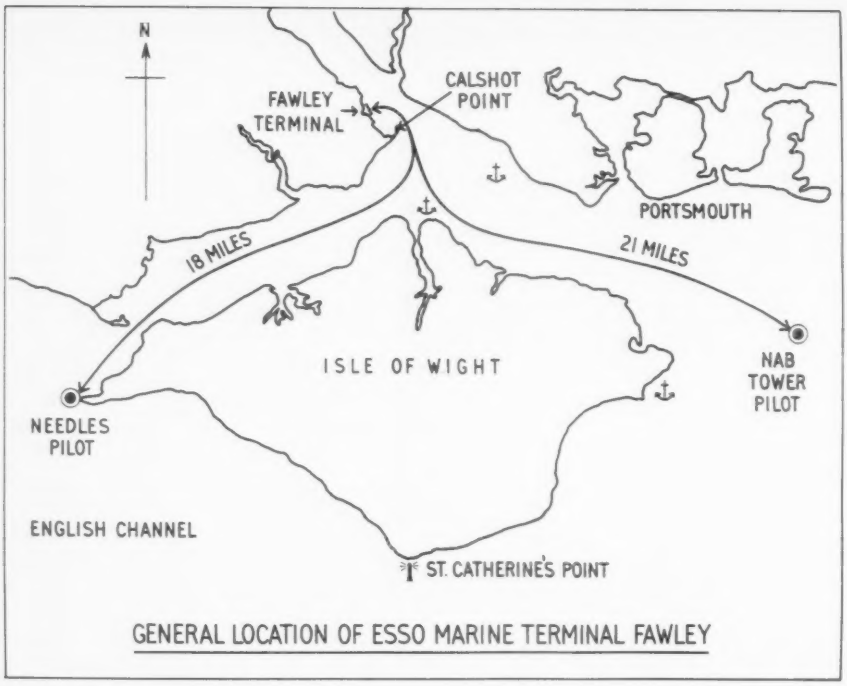
DIMENSIONAL CHARACTERISTICS—14,800 TO 104,500-DW TONS TANKER

Dw tons summer L/L ...	14,822	16,143	16,500	18,370	26,675	28,330	31,465	36,000	38,440	47,400	65,000	77,500	85,000	100,000	104,520
Displacement summer L/L ...	19,547	21,926	21,880	24,398	35,064	37,596	41,065	48,045	49,460	61,800	81,300	99,680	109,000	125,000	137,140
T.P.I. ,, ,, ...	65·2	67·0	68	75	98	102	110	122	125	153	185	193	223	250	260
Draft ,, ,, ...	28 ft 3 in	30 ft 2½ in	30 ft 2 in	29 ft 9½ in	32 ft 5 in	34 ft 2 in	35 ft 4 in	35 ft 7 in	36 ft 3 in	37 ft 6 in	42 ft 0 in	47 ft 0 in	46 ft 0 in	49 ft 0 in	48 ft 0 in
Length A	503½ ft	523½ ft	523½ ft	556 ft	628 ft	644 ft	660 ft	690 ft	700 ft	740 ft	820 ft	856 ft	890 ft	935 ft	949½ ft
Beam B	68 ft	68 ft	68 ft	69½ ft	82½ ft	80½ ft	84½ ft	90 ft	89 ft	102 ft	112 ft	112½ ft	125 ft	132 ft	135 ft
C	216 ft	251½ ft	244 ft	290 ft	290 ft	333 ft	355 ft	314 ft	343 ft	362 ft	400 ft	420 ft	435 ft	450 ft	499/579 ft
D	288 ft	272½ ft	279½ ft	266 ft	338 ft	311 ft	305 ft	375 ft	357 ft	378 ft	420 ft	436 ft	455 ft	485 ft	451 ft
E	97 ft	88 ft	88 ft	152 ft	105 ft	162 ft	168 ft	140 ft	166 ft	170 ft	240 ft	220 ft	270 ft	180 ft	—
F	135 ft	112 ft	112 ft	58 ft	160 ft	73 ft	81 ft	170 ft	109 ft	160 ft	250 ft	210 ft	280 ft	180 ft	—
Freeboard S L/L G	8 ft 1 in	9 ft 3 in	9 ft 3 in	9 ft 3 in	10 ft 3 in	10 ft 10 in	11 ft 11 in	11 ft 8 in	12 ft 9 in	12 ft 10 in	14 ft 0in	15 ft 6 in	16 ft 0 in	17 ft 0in	19 ft 6 in
,, L. L/L H ...	28 ft 2 in	30 ft 3 in	30 ft 9 in	30 ft 4 in	33 ft 10 in	36 ft 10 in	38 ft 2 in	37 ft 6 in	39 ft 9 in	38 ft 0 in	44 ft 9 in	48 ft 0 in	49 ft 6 in	52 ft 0 in	52 ft 6 in
Manifold/deck K ...	2 ft 6 in	4 ft 6 in	4 ft 6 in	4 ft 0 in	4 ft 6 in	4 ft 3 in	4 ft 5 in	4 ft 6 in	4 ft 2 in	4 ft 6 in	5 ft 0 in	5 ft 0 in	5 ft 0 in	5 ft 0 in	5 ft 0 in
,, /side L	20½	17	14	14½	15	20½	16	16	17½	15	15	15	15	15	8
Lightship area (sq ft)	18,495	19,545	19,000	24,500	26,970	32,000	35,000	34,000	38,850	40,000	48,400	53,700	57,000	63,000	63,000
*Wind thrust (approx):—															
30 m.p.h. (tons)	24	25	25	32	35	42	45	44	50	52	63	70	74	82	82
50 m.p.h. ,, ...	67	71	69	89	97	116	127	123	140	145	175	194	206	228	228
70 m.p.h. ,, ...	131	139	135	174	191	227	248	241	275	284	343	381	404	447	447
†Impact load at 17½ ft/min(tons)	12·9	14·5	14·5	16·1	23·2	24·8	27·1	31·6	32·7	40·7	53·7	65·8	72·0	82·6	90·6
Cargo pumps	3	4	3	4	4	4	3	4	3	4	5	3	6	6	4
T.P.H. water each	500	500	450	475	965	400	1070	1375	1070	1375	1375	2500	1375	1375	1600
P.S.I.		125	100	120	125	125	150	150	150	150	150	150	150	150	150
Hose connexion No.	1 or 3	8	6	8	8	8	12	8	12	6	10	5 or 6	12	12	4
Sizes ins	6 or 8	8 or 10	8 or 10	8 or 10	8 or 10	8/10/12	8 or 10	8 or 10	8 or 10	8/10/12	8/10/12	8/10/12	8/10/12	8/10/12	12 or 14

* Beam wind and shape coefficient 1·6 assumed. Formula used $P = \cdot 004(\cdot 9V)^2$ from E.R.E.C., Linden, N.J.

† Calculated for half-mass.

Height (ft approx) or Mooring Chocks above Light Water Line				*D.W.T.*	*Midship. Derricks*	*Manifold Flange*
Foc'sl	Foc'sl	Aft	Poop		S.W.L.	Type
	Main Deck					
59	40	29	35	26,000	5	
64	45	29	36	36,000	5	BS 1560
66	47	34	38	47,000	10	(1958)
68	48	42	52	77,000	10	Class 150



GENERAL LOCATION OF ESSO MARINE TERMINAL FAWLEY

marine terminal. Southampton Water enjoys the unique facility of double high waters combining with an intermediate stand on the early flood tide and over a total tidal period of 12½ hrs; the tide is rising or slack for 8¼ hrs.

The marine terminal is fronted by 2000 ft of deep navigable channel and is isolated from shipping concentrations other than traffic inward or outward bound to or from Southampton. A very efficient electric floodlighting system provides adequate illumination of the berths and the decks of berthed tankers. The lighting system is positioned to avoid impeding navigation of other vessels navigating the Fairway to and from Southampton Docks and includes suitably positioned flameproof spotlights on the jetty structure to enable ships officers to read the ships draft at night.

Tidal data	*ft*	*in*
Average high water (above Port Low Water Datum) ...	12	0
Average low water (above Port Low Water Datum)... ...	2	0
Average high water of spring tides (above Port Low Water Datum)	13	3
Average high water of neap tides (above Port Low Water Datum)	11	0
Average low water of spring tides (above Port Low Water Datum)	0	0
Average low water of neap tides (above Port Low Water Datum)	3	3
Highest high water recorded 27/11/24 (above Port Low Water Datum)	16	9
Lowest low water recorded 6/2/35 (below Port Low Water Datum)	2	8
Average range of tide (at spring tides)	13	3
Average range of tide (at neap tides)	7	9

Depths in seaward approaches

Least depth 36 ft below Chart Datum—Nab Shoal to Spithead.
Least depth 37 ft below Port Low Water Datum from Solent to Fawley Beacon.
Least depth 35 ft below Port Low Water Datum from Fawley Beacon to Southampton Docks.

The tides in Southampton Water, including the Fawley area, are remarkable for two notable phenomena. These are two high-water crests separated by an interval of about 2 hrs occurring twice daily, and the "first flood" stand, which is an interruption of the normal rise on the flood between low water and the following first high water.

The "young flood" involves a tidal stand of 5 to 6 ft above Port Low Water Datum and lasts for about 2 hrs after Low Water. This represents one of the principal features of Southampton Water since it coincides with slack water, thus creating ideal conditions for manoeuvring loaded tankers to and from the berths.

Initial Construction of the Marine Terminal

The initial design of the terminal followed a series of investigations carried out by consulting engineers working in collaboration with refinery engineering and marine experts, Southampton Harbour Board officials, and the local Trinity House pilots.

The first terminal at Fawley included an approach road and pipe band trestle 1900 ft in length connecting the foreshore above high water mark with the pierhead trestle which had an overall length of 3200 ft. Ocean tanker berths—Nos 1, 2, 3, and 4 can accommodate 47,000-dw ton tankers, having dimensions 750 ft overall length, proportionate beam, and maximum drafts 36 ft at No 1, 37 ft at Nos 2 and 3, and 39 to 40 ft, depending on prevailing tide level, at No 4. Nos 1 and 2 berths tend to silt and are maintained by periodic maintenance dredging.

The four 230 ft breasting island berths, Nos 1 to 4 inclusive, are positioned 400 ft from, and almost parallel to, the foreshore and in alignment with the normal ebb and flood tidal streams, which set approximately 140/320 respectively with a maximum velocity of 2½ knots on the ebb tide, and 1¼ knots on the flood tide. Nos 1 to 4 berths are spaced on 800 ft centres, with the 2470 ft length pierhead trestle parallel to and 130 ft behind the face of the breasting islands. Four trestles connect the four breasting islands to the pierhead trestle and two mooring dolphins are installed at each end of the pierhead trestle. A cooling water pumphouse, a parking area for vehicles, and the dockmaster's and Marine Department office building are installed at the extreme end of the approach trestle adjacent to the pierhead.

The No 6 berth for reception of coastal tankers is located on the inshore side of the pierhead trestle and can accommodate vessels having dimensions 300 ft overall length, proportionate beam, and 20 ft maximum salt water draft. The normal least depths in the approaches to and fronting No. 6 coaster berth is 22 ft below Port Low Water Datum.

The major portions of the structures on the pierhead and pumphouse area, including the dock office building, are supported on hollow cylindrical piles and the approach

causeway on rectangular piles. Sand filled cylindrical monoliths are fitted as strong-points in the pier to resist horizontal forces imposed when berthing and mooring large vessels. Mooring bollards are provided on each of the monoliths, the north and south dolphins, and are also spaced at intervals on the deck between the breasting island monoliths. Double mooring bollards and "Bean" type bollards are designed to withstand a "pull" load in excess of 30 and 60 tons per bollard respectively. All marine terminal construction is designed to withstand a maximum wind velocity of 78 statute miles hour with winds from any direction. The cylindrical piles have an outside diameter of 32 in and an inside diameter of 20½ in with a wall 5¾ in thick. The piles are fixed about 10 ft below the harbour bed. Each breasting island comprises two 40-ft monoliths on 196-ft centres.

Fendering Arrangements

Four fender units are installed on the face of each of the four breasting islands. Each fender unit includes a heavy steel "H" frame faced with 12 sq in Greenheart rubbing strips supported on 24 in × 12 in steel piles. Thirty-ton multiple coil spring buffers are introduced between the piles and concrete structure, and the Greenheart rubbing strips extend from the underside of the loading platform structure to approximately 15 ft below low water level. The fendering arrangements are designed to absorb the normal component of the kinetic energy of a fully laden tanker exceeding 39,000 dw tons approaching the berth at a speed of 1 mile/hour and striking the fender system at an angle of 10° with the face of the breasting island, when the energy is considered as being absorbed by three of the spring buffers.

The No 1 layby mooring berth is located south-eastward of the marine terminal and was completed in October 1953. This two-buoy mooring berth is designed for accommodating tankers up to and including fully laden 26,800 dw tons waiting berth and/or repairing. The berth has a least depth of 35 ft below Port Low Water Datum.

Operational Considerations

The siting of the terminal complies with the provisions of the Southampton Harbour Board's Petroleum Spirit Bye-law No 5.—This states that "No petroleum ship shall anchor, moor, or pass within the River Hamble at all, save as provided by bye-law No 7, and no petroleum ship shall anchor, moor, or pass above or to the northward of a line drawn 032 -212 through Fawley Beacon, except petroleum ships of a capacity not exceeding in the case of a self-propelling ship 1100 tons and in the case of any other ship 500 tons, and provided that such ship is not carrying more than 500 tons of petroleum spirit".

The navigable channel off Fawley is regularly used by many of the largest passenger liners afloat, and it was necessary to consider whether the minimum speed at which those vessels may require to proceed with safety in the varying conditions of tide, wind, and weather was such as to cause damage to tankers lying alongside the proposed new jetties, to their moorings, or to the jetties. The possibility of damage being occasioned varies according to the state of the tide; for example, the passage of a vessel of the size of the *Mauretania* or one of the Union Castle mail vessels at low water, *i.e.* with as little as 4 to 6 ft of water under them, would be more likely to cause damage than the *Queen Mary* or *Queen Elizabeth* navigating the channel at high water.

The liability to wash damage depends, to a material extent, not only upon the speed and manner in which a passing vessel is navigated, but also upon the adequacy of and proper attention to the moorings of the stationary vessel. To avoid damage not only to the tankers discharging or loading, but also to the jetties themselves, the "breasting islands" were equipped with spring fenders and a system of permanent moorings which is a balanced one capable of preventing damage so long as passing vessels proceed with care. The permanent breasting and back-spring moorings comprise 22-in circumference coir and 4½-in circumference 6 × 37 f.s.w. rope, provided by the marine terminal, but other moorings, *i.e.* head and stern lines and supplementary moorings, are normal ship's equipment.

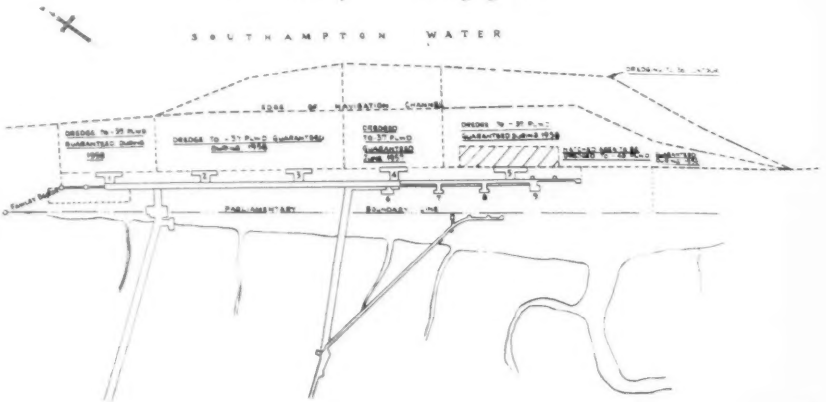
The terminal is manned by experienced jetty personnel who maintain continuous watch on moorings and ships' equipment 24 hrs a day. The method of mooring tankers presently used was approved by the Ministry of Transport and the Southampton Harbour Board, and has proved most efficient in service.

Hose handling structures are provided above the loading discharging manifold connexions at each of the four ocean tanker berths. These include compressed air driven travelling hoists installed on "swingarms" to cover all flexible hose positions between jetty and tanker manifold connexions, simultaneously supporting up to 4- × 8-in circumference flexible hoses. The design of the hose handling structure and motorized hoisting facilities provides for the combined effect of the tankers' draft and minus variable tide levels. A single boom structure is provided at both the forward and aft bunkering manifold connexions at each berth for supporting the flexible hoses used in bunkering tankers simultaneously with cargo loading or discharging operations.

Esso Marine Terminal Extensions

Early in 1949, prior to construction of the marine terminal, Esso Engineering, Refining and Marine Department representatives together determined the number of tanker berths needed for the initial refinery operations. Calculation of the number of berths required was based on estimated tanker turnaround times, including the operations of mooring,

The berth layout and dredging areas



unmooring, connecting and disconnecting hoses, unloading, loading, ballasting, and miscellaneous operations included in the formula:—

$$\text{Berths required} = \frac{\text{No of tankers year} \times \text{average time at berth}}{\text{Berth availability (hours year)} \times 60 \text{ per cent (berth occupancy)}}$$

By the end of 1953 the average berth occupancy of all the berths had increased to 63·6 per cent. Since the throughput of crude was expected to show a further increase from 1957 onwards, studies were made during 1956 which confirmed the need for additional tanker berthing facilities.

Early in 1957, a team of specialists began to assess the additional berthing facilities required, using operational research techniques in place of the formerly used "rule of thumb" methods. The results obtained from these studies confirmed the need for additional berthing facilities.

The contract for the extensions was awarded on a design and construction basis during 1956, and was completed in 1958. Included were No 5 ocean tanker berth accommodating vessels exceeding 65,000 dw tons; Nos 7 and 8 additional coastal tanker berths, each accommodating vessels of 2500 dw tons, and No 9 Berth accommodating 5000-dw ton tankers.

The former No 5 coastal tanker berth has since been renumbered No 6, and the former AGWI jetty head at the rear of the terminal is to be demolished to facilitate manoeuvering coastal tankers to and from Nos 6, 7, and 8 coastal tanker berths. These extensions include a new 40 ft wide double tier pipeline approach trestle and a 12 ft wide road access for vehicular traffic between the foreshore and the pierhead trestle extension.

The new jetty extensions comprise reinforced concrete slabs supported on pre-stressed piles. The horizontal forces imposed by the impact of the vessel when berthing and design windloading of 70 mph is absorbed by raker piles. Hundred-ton Bean bollards are installed for reception of the larger tankers mooring adjacent to No 5 berth.

Resilient fendering is provided on the faces of all new berths. On No 5 ocean berth, spring buffers are installed which compress 12 ins with impact loads of 28 tons. In all, five fender units are installed. The two end units comprise eight buffers and the three intermediate units four buffers. The coastal tanker berth fendering includes two units comprising 15 in dia cylindrical rubber tubing each of which absorbs a compression load of 15 tons. The new No 5 berth is established on 1000 ft centre spacing with No 4 berth to facilitate handling the larger tankers at No 5. The 300 ft breasting face of No 5 berth is designed to provide for the lengthier parallel middle body lengths of the larger tankers.

In 1959 the crude oil throughput at the refinery exceeded 10 million tons. The marine terminal jetties handled, in and out, 23½ million tons of crude oil and refined products and 4896 tankers, *i.e.* 47½ per cent of all ships using the port of Southampton.

Draft Limitations

The 40 ft 6 in maximum draft limitation for tankers presently assigned to the new No 5 jetty is necessary because of the restrictive high water depths over the outer Nab and inner approach channels to the port.

It might appear incongruous that the port of Southampton, which can regularly accept the world's largest liners, is presently unable to accept the larger tankers fully laden. Since the Nab Shoal is located seaward of the Portsmouth and Southampton harbour limits, there is presently no incentive for the appropriate harbour authorities to incur expensive dredging costs so long as the Nab Shoal limitation remains as it is.

The draft limitation permits regular assignment of partially laden 77,000-dw ton tankers to Fawley crossing the Nab Shoal at or near high water springs allowing for increased draft due to "squat" (2 ft) and "rolling–4°" (3 ft 9 in). However, if heavy swell conditions obtain at or near high water neap tides it may be necessary to temporarily delay the vessel's entry until swell conditions subside to ensure safe bottom clearance.

Existing charted water depth limitations over the Nab Shoal are as follows:—

	Neaps	*Springs*
L.W.O.S.T. datum depths	= 36 ft 0 in	36 ft 0 in
Plus height of tide at high water	= 10 ,, 2 ,,	12 ,, 7 ,,
Available water depth at high water	= 46 ft 2 in	48 ft 7 in

The increase of draft due to vessel heeling is 1/10-in foot of beam/degree of heel deducting an allowance for rise of floor and round of bilge, which in the 77,000-dw ton tanker is 2½ in. Although the *Queen Mary* has been known to heel 8° off the Nab, the high centre of gravity of this vessel with her high superstructure is not comparable with a fuller form 77,000-dw ton tanker which under comparable swell conditions is unlikely to exceed 4° heel as allowed for above. Both the 65,000- and 77,000-dw ton tankers, having beams of 112 ft and 112 ft 6 in respectively, increase their draft by approximately 11 in/degree of heel since there is little difference in their beam dimensions.

Tug Facilities

It was considered desirable to have two tugs permanently stationed adjacent to the marine terminal and two specially designed and equipped diesel tugs were built by J. I. Thornycroft & Co. Ltd for the Southampton, Isle of Wight, and South of England Royal Mail Steam Packet Co. Ltd, for this purpose.

By special arrangement with the owners, the two tugs are operated by the Fawley office of the Esso Marine Department, being in continuous contact with the duty dispatcher by radio telephone. When not employed in handling a vessel, they lie to their own mooring buoy south of the jetties and are only permitted to leave the Fawley area under special circumstances.

These tugs are 100 ft in length with 27 ft beam and have a maximum draft of 12 ft. They are fitted with twin Crossley diesel motors of 1340 bhp, achieving a bollard pull of 20 tons or a speed of 12 knots. In place of the conventional method of a hawser connected to the stern towing hook, they have adopted the method of securing to a short forward towing spring and pushing with bow against the vessel.

To assist with firefighting on the jetty or aboard vessels, each tug is fitted with special fire-fighting equipment, which includes a diesel motor driven centrifugal pump capable of delivering 3000 gal/min against a 276 ft head to six swivel monitors and eight hose connexions simultaneously.

Four monitors are fitted on top of the wheelhouse and two others at the after end of the boat-deck. Twin fire-hose connexions are located at each corner of the superstructure at main deck level. Liquid foam can be delivered to all of these points, either simultaneously or selectively as may be required. They are capable of a total output of about 16,000 gal/min of foam. A supply of 6000 gal of liquid foam compound is carried aboard each tug, and this amount is

sufficient to supply all hose and monitor positions for a period of 95 min.

Under normal conditions the two tugs are sufficient to handle all but the largest vessels. If additional tugs are required for the larger tankers they can usually be obtained from Southampton within an hour.

Marine Terminal Design Criteria

The design of tanker jetties over the years has been accomplished mainly by using rough assumptions of loadings and very conservative factors of safety. The advent of increasingly larger tankers has raised costs of terminal facilities considerably. This prompted Esso engineers to reconsider the basis upon which jetty structures are designed.

There are several methods of recording wind velocity in general use. Among them—Hourly mean velocity; Five minute average velocity; Fastest mile velocity; and Gust velocity.

The "fastest mile" velocity was selected as the velocity to be used for design computations. This is computed on the time it takes a unit mile of air to pass a recording point. The reason for adopting it was that the large mass of a tanker would not be affected by gusts since time is required to overcome the inertia of the tanker and gusts are localized and would act only on part of the tanker. The "fastest mile" velocity allows an interval of time for the wind to exert its full pressure. It is less than a gust velocity and higher than a five-minute average velocity. The British Standard code of practice recommends that the design wind velocity should be the mean velocity over a period of one minute. At a velocity of 60 mph the "fastest mile" and one minute mean velocities are equal. The recorded wind velocities are converted to an elevation of 50 ft above the water for convenience. The effective velocity over the total height of the tanker is 0·9 times the 50 ft velocity.

The "fastest mile" velocity corrected for height is used in the basic equation for computing velocity pressure. A shape coefficient of 1·6 is applied to the velocity pressure to allow for the combined suction-pressure effect. This new design basis is only used where reliable wind data is available.

The selection of a wind velocity for design is a matter of engineering judgment. If the master of a tanker has sufficient warning of an approaching storm, he will generally do one of two things, either take the tanker to sea or ballast the ship as much as possible by stopping discharge of cargo or taking on ballast water. This being the case, two wind velocities are compared. The first would be the maximum wind for which no advance warning could be anticipated on a fully light tanker. The second is the maximum wind velocity occurring once in 10 or 15 years for which sufficient advance warning can be assured so a tanker can prepare for the storm by ballasting to reduce its exposed area to one half. The wind velocity that causes the greater force on the pier is selected for design.

Any unforeseen circumstances where wind of higher velocity might occur are covered by a safety factor of 1·5 which is used in the design to protect against overloading.

The forces computed for wave and current acting on a tanker must be considered along with the force caused by the wind. The impact forces due to berthing are considered in the flexible fender design so that the reaction due to berthing is kept below or equal to the strength provided in the pier to resist the forces due to wind, waves, and current.

When berthing the 56,000-dw ton ore-tanker *Sinclair Petrolore* at the No 3 jetty in December 1956, the refinery Mechanical Department engineers took instrument measurements which confirmed that the deflection of the spring buffer units on impact averaged 7½ in against the maximum compression of 12 in and that the approach speed by theodolite observation was exactly 6 ft/min. The vessel was berthed stemming the last of the flood tide and was assisted by tugs. The *Sinclair Petrolore*'s mean draft was 39 ft 3½ in with equivalent displacement of approximately 77,000 tons.

Jetty head showing monolith, spring fender unit, and hose handling gantry

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HYDROCARBON RESEARCH GROUP

Third Symposium on Spectroscopy

The Hydrocarbon Research Group of the Institute of Petroleum will hold its third Symposium on Spectroscopy in the William Beveridge Hall of the University of London on 28–31 March 1962. It will be similar to those held in 1954 and 1958 and will review progress in many spectroscopic fields. These will include:

Infra-red and Raman spectroscopy
Nuclear and electron spin resonance
Spectra of free radicals
Vacuum ultra-violet spectra and ionization potentials
X-ray fluorescence and atomic absorption spectra.

The full programme and registration forms will be distributed later, but application for attendance and further details should be sent to: The General Secretary, Institute of Petroleum, 61 New Cavendish Street, London, W.1.

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MASS SPECTROMETRY CONFERENCE

Members are reminded that a joint conference on mass spectrometry, organized by ASTM Committee E14 and the Mass Spectrometry Panel of the Hydrocarbon Research Group, Institute of Petroleum, will be held at Oxford on 12–15 September 1961.

Details may be obtained from either Dr R. R. Gordon, National Coal Board, Coal Research Establishment, Stoke Orchard, Cheltenham, Glos.; or W. J. Brown, Scientific Apparatus Dept., AEI Ltd, Trafford Park, Manchester 17.

Laboratory Apparatus and Materials Exhibition 1961

Many Orders from Overseas Visitors

Over seventy exhibitors took part in the second Laboratory Apparatus and Materials Exhibition held at the Royal Horticultural Society's New Hall recently.

Among the visitors were scientists and technologists from Scandinavia, Canada, Australia, New Zealand, Germany, the Middle East, the Far East, and Africa. Some exhibitors had booked orders from overseas visitors before lunchtime on the first morning.

It was not surprising that the Exhibition should attract such wide interest, for there were many new materials and items of equipment on show. These included a number of foreign exhibits featured on the stands of their British agents.

During the course of the Exhibition, twelve lectures were presented in the RHS lecture hall. These included "Vapour Phase Chromatography" by R. P. W. Scott of Benzole Producers Ltd, "Radio-frequency Methods in Analytical Chemistry" by W. H. Lee of the Battersea College of Technology; and "The Weisz Ringoven Technique in Microchemistry" by W. I. Stephen of Birmingham University.

Among the exhibitors were the following. Fuller details of the products mentioned can be obtained direct from the companies.

Analytical Measurements Ltd, Dome Buildings, The Quadrant, Richmond, Surrey.

A range of pH meters including the Model 700 mains-operated meter which incorporates a 7-in continuous scale with 0·02 readability; a pocket meter which is supplied complete with leather carrying case; the *Redox* pH meter which provides a double scale for pH and mV readings and has a range of 0–14 pH which can be read to within 0·02 pH and 1400 mV; and a recording pH meter. The pH probe unit supplied with the meters combines reference and glass electrodes as one unit. There is a bulb-type probe and a spear-type which measures semi-solids or soil covering a range from 0–14 pH and up to 95 C.

Coulter Electronics, 2 4 Ashwell Street, St. Albans, Herts.

The Coulter counter produces data on particle size, count, and size distribution fast enough for flow-line process control. In the Coulter principle a dilute suspension of the sample in an electrolyte is drawn through a small aperture through which a current is flowing. The passage of each particle changes the resistance of the aperture proportionately to its volume and the resultant pulses are amplified, scaled, and counted at various threshold levels, giving a size distribution from 0·5 microns to 300 microns.

Degenhardt & Co. Ltd, 6 Cavendish Square, London, W.1.

Among the exhibits on this stand was the Zeiss Spectrophotometer PMQII, equipped with a 100-point automatic base-line device to automatically set the instrument when the comparison cell is brought into the beam by a sample changer. In addition to other Carl Zeiss equipment, the Company also showed Colora Ultra thermostats. These will maintain a bath of flowing liquid at a constant temperature within an accuracy of ±0·01 C.

A. Gallenkamp & Co. Ltd, Technico House, Sun Street, London, E.C.2.

The Automatic Adiabatic Bomb Calorimeter for the determination of calorific value of fuels and foods conforms with BS 1016, IP 12, and ASTM D–240. Electronic controls enable continuous automatic equalization of the temperature of the bomb and its jacket, and so, by preventing the exchange of heat, eliminates the need for any cooling corrections. This makes complete determinations possible in 20 minutes instead of the usual hour. Other exhibits included monometric gas analysis apparatus, a photoelectric calorimeter, and a sedimentation balance with automatic recording.

Grant Instruments (Cambridge) Ltd, Barrington, Cambridge.

Exhibits included a new thermistor thermometer for measuring temperatures in liquids, solids, or gases. The large change of resistance with change of temperature shown by the thermistor element affects the current drawn from the mercury battery through the resistance network. This gives the reading on the microammeter, which is fitted with a 5-in anti-parallox mirror scale and a knife-edge pointer. Because of the smallness of the thermistor element, the amount of heat drawn from the object to be measured is negligible, and readings can be made in 2 or 3 seconds. Full scale spans range from 10 C to 100 C, with accuracy 1 per cent of scale.

Griffin & George Group of Companies, Ealing Road, Alperton, Wembley, Middlesex.

A wide range of equipment and furniture included the Griffin D6 gas chromatograph. This incorporates the Martin Gas Density Balance, an absolute detector which measures the change in density as the sample emerges from the chromatographic column. This model will, therefore, analyse both organic and inorganic compounds. Calibration is made unnecessary for a sample of known molecular weight, and, in fact, the instrument can determine the molecular weight of an unknown substance.

V. A. Howe & Co. Ltd., 46 Pembridge Road, London, W.11.

Among foreign equipment featured on this stand were pH meters, polarographs, titrators, and automatic titration recorders manufactured by Radiometer of Copenhagen. These included the new Model pHM4 transistorized potentiometric pH meter which reads direct in pH (0 to 14) or mV (0 to ±1500). The instrument is claimed to have a low zero drift, an accuracy for pH differences to ±0·001 pH, and an accuracy for mV measurements of ±0·2 mV±0·05 per cent.

Isopad Ltd, Barnet By-Pass, Boreham Wood, Herts.

This firm showed the full range of its electric heating mantles for laboratory flasks and glass plant. These are made in all sizes for glass plant up to 200 litre capacity, and there is a special multisize design which allows the use of one heating mantle for several flask sizes. Isomantles type FPM are for use in areas officially classified as flame-proof. The heating surface of the mantles is made from glass yarn, withstanding temperatures up to 550 C. They operate at "black heat", transferring the heat to the liquid partly by convection and partly by radiation. There is also a special high temperature mantle made of quartz yarn for liquid temperatures up to 600 C.

May & Baker Ltd, Dagenham, Essex.

Chemicals and reagents featured on this stand included *Embaphase* stationary phases and *Embacel* kieselguhr support media for gas chromatography. A new *Volucon* range of concentrated volumetric solutions in specially designed ampoules has been introduced by the Company recently. When diluted with distilled water, each ampoule provides 1 litre of accurately standardized water. A new Karl Fischer reagent is said to retain its strength during storage so that standardization of the reagent is not necessary.

The Northern Media Supply, 11 12 Blanket Row, Hull, Yorkshire.

Gallia infra-red moisture meters were among the equipment featured by this company. These are automatic, requiring sampling only, and enable direct readings of percentage moisture to be obtained. Calculations are eliminated and with the controllable heat source correct drying temperatures for particular products can be ascertained. The moisture meter and the Thermo-Balance Model II can also be used for therma-gravimetric analysis and research work, including, particularly, the field of mineral and organic hydrates.

The Passfield Research Laboratories near Liphook in Hampshire

Anglo-American Project could mean Improved Packaging

The new Passfield Research Laboratories near Liphook in Hampshire is the joint project of two companies from either side of the Atlantic. They have embarked on an ambitious research programme designed to lead to improved containers in steel, plastics, and fibre materials and new steel/plastic and fibre/plastic packaging systems.

The British company in this trans-Atlantic programme of co-operation is Metal Containers Ltd and the American company is the Inland Steel Container Company.

There are four research sections at the Laboratories. These deal with analytical chemistry, organic chemistry, physical chemistry and physics, and development. Because the value of the overall work depends to a great extent on the analytical facilities, the development section contains extensive equipment for analysis by physical methods, including infra-red and ultra-violet absorption spectrophotometry, and a vapour phase chromatograph will be installed shortly for the analysis of the components of paints and plastics.

The well equipped organic chemistry laboratory will specialize in matters concerning paint adhesion, evaluation of plastics, and the study of papers and adhesives used in drum manufacture. Concerned with the more theoretical aspects of the companies' chemical work, the physical chemical laboratory will study reaction kinetics, thermodynamics, and problems of metallurgy, electrochemistry, corrosion, and protection.

The physics laboratory will deal with the physical measurements of the electrical, optical, thermal, mechanical, and rheological properties of materials. One important aspect of this section's work will be micro-structural studies by means of X-ray diffraction. The development section will work on the pre-production evaluation of new materials and processes as well as the development of manufacturing techniques and equipment in the field of plastic containers and liners.

Fifty graduates, most of them British, are employed at the laboratories, which were designed by Architects Co-Partnership of London and built by Bovis Ltd. The buildings incorporate well equipped workshops to cope with mechanical, electrical, and instrument requirements of the laboratory sections as they occur.

U.K. OIL CONSUMPTION ROSE 9·2 PER CENT IN FIRST QUARTER

U.K. oil consumption totalled 12,259,683 tons during the first three months of this year. This was over 500,000 tons more than in the previous quarter and 9·2 per cent, or more than 1 million tons, higher than in the first three months of 1960.

Demand rose for nearly all the main products. Fuel oil deliveries of 5,431,003 tons were 9·1 per cent above the previous quarter, and consumption of gas/diesel oil rose by 12·6 per cent to 1,138,164 tons.

Motor spirit deliveries increased by some 10·0 per cent to 1,811,236 tons. A large increase in demand for premier grades was again accompanied by a slight drop in demand for standard grades, which now account for less than one third of total U.K. sales of motor spirit. Deliveries of derv rose by 10·3 per cent to 683,072 tons. Consumption of aviation fuels (at 451,747 tons) and bitumen (270,135 tons) were both more than 16 per cent higher, while that of chemical feedstock climbed by 15·4 per cent to 404,107 tons.

The only major product to record lower deliveries was kerosine. The milder weather brought a 13·6 per cent drop in the use of burning oil to 483,846 tons.

According to the Petroleum Information Bureau which compiled these figures, a fractional rise in the use of vaporizing oil for tractors reflected increased ploughing rather than a check in the changeover to diesel-engined tractors.

U.K. Deliveries into Inland Consumption of Petroleum Products

Product	*January to March*	
	1960	1961
	tons	*tons*
Aviation fuels	387,792	451,747
Motor spirit (including motor benzole) ...	1,646,180	1,811,236
Industrial spirits (including industrial benzole)	57,826	59,843
White spirit	38,858	36,786
Kerosine:		
Burning oil	560,090	483,846
Vaporizing oil	66,444	68,308
	626,534	552,154
Derv fuel	619,383	683,072
Gas, diesel, and fuel oils:		
Gas/diesel oil	1,010,772	1,138,164
Fuel oil	4,978,044	5,431,003
Refinery consumption	816,958	893,377
	6,805,774	7,462,544
Lubricating oils and greases	236,109	240,360
Paraffin wax and scale ...	13,803	12,844
Propane and butane ...	39,190	51,481
Bitumen	231,507	270,135
Chemical feedstock ...	350,269	404,107
Light distillate feedstock	118,875	160,206
Refinery gases	56,460	63,168
	11,228,560	12,259,683

Books and Films

Record Sales for Standard Jersey in 1960

The Standard Oil Company (New Jersey) increased its sales of oil products by 6 per cent in 1960 to an average of 3,163,000 bd. This record figure played a substantial part in the achievement of a 9 per cent rise in the Company's net income, which reached $688,573,000.

These figures are given in the Company's 1960 Annual Report, which shows also that capital expenditures for property, plant, and equipment by consolidated companies during the year dropped slightly to $719,755,000. Additionally, $199,463,000 was spent in the search for crude oil and gas reserves.

Higher operating levels were partly responsible for a rise of 4 per cent, or $93,529,000, in the group's tax and other payments to U.S. and other governments. These reached $2,611,356,000.

There was a substantial advance in sales of chemicals, which rose by 15 per cent to $295 million. A quarter of the $68,600,000 spent by affiliates on research was devoted to the development of chemical products. The 1960 research bill was $1½ million higher than in 1959.

Worldwide production of crude oil and natural gas liquids by the group averaged 2,514,000 bd for the year, a figure which was 2 per cent above that for 1959. In refining, crude runs by affiliates amounted to 2,871,000 bd, almost 3 per cent higher than in 1959.

Natural gas is playing an increasingly important part in the group's operations. Sales of natural gas in the United States rose by 2·5 per cent to average 1560 million cu ft/day.

During the year affiliates drilled 340 net exploration wells, against 332 in 1959. Crude oil was discovered in 68 and gas in 28. The number of net development wells drilled rose by 157 to 1098, the increased activity taking place in the United States, Canada, Peru, France, and Libya.

Petroleum Bibliography

Petroleum Sourcebook 1960 contains over 5000 references to technical articles, papers, maps, books, and special publications published in 1959 in the trade press, publications of professional societies, state and federal agencies, and mapping, statistical, and financial institutions. The bibliography is particularly useful for locating data on particular oil or gas fields. It is priced at $7·50 from National Petroleum Bibliography, Box 3586, Amarillo, Texas.

Statistical Summary of the Mineral Industry

Statistical Summary of the Mineral Industry 1954–1959 devotes 44 of its 396 pages to a review of world production, exports, and imports of petroleum and its products, including crude oil, natural gasoline, natural gas, and oil shale.

The book is an extremely valuable statistical analysis of production, imports, and exports of the world's mineral wealth during the six years up to 1959. It gives a complete country by country coverage which is particularly valuable in the case of natural gas and natural gasoline production, for there is no other source of reference containing such detailed information about these products.

Statistical Summary of the Mineral Industry 1954–1959 is published, price £1 7*s* 6*d*, by HMSO.

Heat Bibliography

Heat Bibliography 1959 prepared by the National Engineering Laboratory contains over 4000 references to papers, reports, and books on heat transfer and related subjects. It includes references on many types of heat exchanger, basic heat-transfer processes, the physical properties of gases and liquids, instruments for measuring temperature and flow rate, and economics of heat-exchange plant, the effects of corrosion and fouling on the efficiency of heat exchangers, and many other associated topics.

The references were obtained from original publications and abstract journals and all relevant titles noted in NEL during 1959 have been listed. They have been arranged under a simple subject classification which avoids extensive cross referencing.

The bibliography will be of particular use to manufacturers and users of all types of heat exchange plant (including boilers, condensers, liquid coolers, refrigerators, and distillation equipment) and to research workers in the field of heat transfer.

The Bibliography is priced at 20*s* 6*d* and can be obtained from H.M. Stationery Office.

Halden Reactor Project Report

The O.E.E.C. European Nuclear Energy Agency has published the Second Report to its Steering Committee of the Halden (Norway) Boiling Heavy Water Reactor Project. The reactor, which first went critical in June 1959 and achieved boiling for the first time in October 1960, is at present the only one of its type to have reached this stage.

The report covers the technical progress achieved from November 1959 to December 1960, and gives a full detailed description of the reactor installation and the general administration of the project.

The report is in six sections, covering organization, reactor design and construction, fuel, reactor operation, safety organization, and the research programme.

U.S. Weights and Measures

A 1959 agreement among the directors of National Standards Laboratories of English speaking nations to obtain uniformity in precise measurements involving the yard and the pound have brought about refinements in the definition of the U.S. customary units of length and mass, and as a result the U.S. Department of Commerce has published *Units of Weights and Measures (United States Customary and Metric)—Definitions and Tables of Equivalents* as National Bureau of Standards Miscellaneous Publication 233.

The units of length, area, volume, capacity and mass in the United States are defined in conformity with the 1959 agreement and the tables of inter-relation and tables of equivalents for these units in the metric system and in the U.S. customary system have been recalculated by automatic computer. Further revisions include the deletion of the table showing inter-relation between bushels and hectolitres and the addition of a more complete table showing equivalents of inches in millimetres.

It can be obtained, price 50 cents including postage, from Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.

Marking of Gas Oil

The new Hydrocarbon Oils (Marking of Gas Oil) Regulations, 1961, which have just come into effect, provide for two chemical markers and a colouring substance to be added, in specified proportions, to gas oil which is to be used otherwise than as road fuel. They also contain subsidiary provisions as to methods of marking, storage warehouse accounts, and powers of enforcement.

The regulations have been published as Statutory Instruments 1961, No 861, and can be obtained from H.M. Stationery Office or any bookseller.

Diesel oil used as road fuel need not be marked since it bears the same duty, 2*s* 6*d* a gallon, as motor spirit. The regulations apply to gas oil used for other purposes, *e.g.* as fuel for stationary engines or for heating, bearing a duty of only 2*d* a gallon.

M.P.'s and Peers See Diesel Fume Film

A film which illustrated the efficacy of a high standard of maintenance in the abatement of diesel engine fumes was shown in the Grand Committee Rooms of the Palace of Westminster recently to an audience which included M.P.'s and members of the House of Lords.

The showing was organized by Lord Colwyn, chairman of the Diesel Exhaust Fume Abatement Society, and the film *You and Your Diesel* was supplied by Shell-Mex and B.P. Ltd. Speakers included Sir Walter Fergusson Hannay; John Maguire, who discussed diesel fumes and Parliament; John D. Lodge, who spoke on the place of additives; and E. H. Robinson, who talked about measuring smoke.

The Diesel Fume Abatement Society intends to begin a series of public meetings during the summer to focus public opinion on the problem of diesel fumes.

Survey of Motor Gasoline

The 1961 *World Wide Survey of Motor Gasoline Quality*, published by the Associated Ethyl Co. Ltd, presents comprehensive details on the properties of motor gasoline in over 150 countries. It also includes conversion tables for volume–weight, temperature, pressure, and comparative TEL concentrations.

Information for the individual countries relates, where applicable, to super, premium, and regular grades, giving octane numbers (research and motor methods), TEL content, vapour pressure, specific gravity, sulphur content, distillation characteristics, and the size of the total market in U.S. gallons.

Excellent use of colour has been made to present this information in easily readable form. The booklet is available from the Associated Ethyl Co. Ltd, 20 Berkeley Square, London, W.1.

The World's Oil Companies

The 1961 *International Petroleum Register* contains some 500 pages of most comprehensive information relating to companies and organizations operating within all spheres of the petroleum industry, including petrochemicals.

The book includes a detailed general index of the world's operating companies, which are also listed in eight classified groups. There is also an excellent equipment and service directory, and an exporters' register.

This is the thirty-sixth edition of this useful work of reference, which is published biennially in the United States, by Mona Palmer. It is distributed in the U.K. through the Company's London Office at St Paul's Corner, Ludgate Hill, London, E.C.4.

BAPCO Report to the Ruler of Bahrain

The Bahrain Petroleum Co. Ltd's total production of crude oil reached 16,500,424 brl in 1960. This brought the total cumulative production to 246,417,607 brl since 1932.

These figures are given in the Company's 1960 *Annual Report to the Ruler of Bahrain and its Dependencies*, which also discloses that throughput at Bahrain refinery rose by 10 per cent during the year to 76,131,623 brl. This was the highest total since 1954 and the second highest in the Company's history. It included 58,462,862 brl of Saudi Arabian crude.

The search for new deposits included the drilling of a wildcat offshore exploration well at Fasht al-Jarim. By the end of the year, the total number of wells drilled in Bahrain had reached 189, of which 148 were producing oil and 5 were producing gas.

The first phase of the extensive modernization scheme at the Sitra loading terminal continued during the year. The work included the construction of a two-berth island wharf, with each berth capable of accommodating 45,000-ton tankers, to replace the existing island structure.

Work was later scheduled to start on improvements to the main T-head wharf. These would enable Nos 1 and 2 berths also to receive 45,000-ton tankers, No 3 berth to accommodate 18,000-ton tankers, and No 4 berth to receive 18,000-ton vessels for handling packaged cargo as well as bulk oil cargo.

A new deep water channel, which was marked out during the year, enabled the 46,000-ton *Transeastern* to sail from the Port of Sitra with the largest ever single shipment of 312,751 brl of products.

Directory of the World's Tankers

The *Tanker Directory of the World* for 1961 follows the same general format as its two predecessors, but some additions and improvements have been made to enhance its value as a work of reference.

The first section, covering some 80 pages, contains nine illustrated articles by specialists in various fields connected with tank shipping. New features include the Suez Canal Navigation Rules for vessels carrying petroleum, and illustrations and particulars of some of the tankers delivered during 1960.

The book's 215-page directory section includes a complete alphabetical list of tankers of over 400 dw tons giving the flag, owners, tonnage, type of propulsion, builders, and year of build; a complete alphabetical list of tanker owners and or managers, with their addresses and fleets.

Tanker Directory of the World is edited by Leonard G. Fay and published by Terminus Publications Ltd, Rosebery House, Bream's Buildings, Fetter Lane, London, E.C.4.

The Work of DECHEMA

The aims of DECHEMA, which for thirty-five years has worked to foster co-operation by chemists and engineers in the field of chemical engineering and technology, is described in a recently published booklet.

Based in Frankfurt, DECHEMA has over 3000 members, many of whom live outside Germany. Some of the more important work detailed in the booklet is concerned with standardization, dissemination of technical information, and research projects.

Copies are available free of charge from DECHEMA, Frankfurt am Main 7, Postfach 7746.

Careers in Fuel

The Institute of Fuel has published an excellent booklet, *Careers in Fuel*, which discusses the current importance of fuel and particularly the opportunities for a career in fuel with special emphasis on training and qualifications.

In a foreword, the Minister of Power says that the booklet is intended mainly for those who are about to leave school, but, as he points out, it should also be valuable to those who are studying applied science or engineering at universities or colleges of technology, but have not decided precisely what line they should follow.

Copies of the booklet can be obtained from The Secretary, The Institute of Fuel, 18 Devonshire Street, Portland Place, London, W.1.

Polyolefin Resin Processes

Polyolefin Resin Processes, by Marshal Sittig, published by the Book Division of Gulf Publishing Company, provides a comprehensive review of U.S. patents in the polyolefin resin process. All U.S. polyolefin patents are listed in order of application, together with the patent application serial number, date, U.S. patent number, and book reference number.

The book's 240 pages cover solid (rather than liquid or viscous) polymers and concentrates on resins, homopolymers of aliphatic mono-olefins, and some copolymers of olefins with other olefinic hydrocarbons. It is available, price $6.50, from the Gulf Publishing Company, P.O. Box 2608, Houston 1, Texas.

Protecting Pipeline Against Corrosion

Wailes Dove Bitumastic Ltd, who manufacture anti-corrosive coating for marine and land application, have produced a film called *Protecting Pipeline against Corrosion* which gives an excellent impression of the Company's activities at its works at Hebburn and in the field.

The film, which commences with a very effective explanation in cartoon form of the mechanism of corrosion, goes on to show the testing techniques which are employed in the factory and the ways in which *Bitumastic 70B* enamel is hot applied to the pipe which has been sent by road to Hebburn for processing.

The work of the Company's contract department is illustrated by showing portable coating and wrapping equipment in operation for the Wales Gas Board near Oswestry and there is a brief sequence showing the equipment in action in the Middle East.

Made for the Company by Turner's Film Productions of Newcastle-upon-Tyne, the film lasts 20 minutes and is in colour. Copies are available on loan from Wailes Dove Bitumastic Ltd, Hebburn, Co. Durham.

U.S. National Bureau of Standards Publications

A complete list of all its publications issued from July 1957 to June 1960 has been published by the U.S. National Bureau of Standards. It also includes papers published by members of the Bureau's staff in outside journals from 1950–1959.

Publications of the National Bureau of Standards, 1 July 1957 to 30 June 1960 contains 391 pages and costs $2·25 from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Overseas remittances must be in U.S. exchange and should include an additional one-fourth of the price for postage.

Tanker Building

More new tanker orders were placed with the world's shipyards in 1960 than in 1959, but despite this the tonnage on order and under construction continued to dwindle, mainly due to the large volume of completions, combined with cancellations and changes of contract. These facts are given in Westinform Shipping Report No 179 entitled *Tanker Building: The Current Position*.

The report estimates that the tanker order book at the end of January 1961, comprised 405 vessels totalling 16,555,000 dw tons. Plagued by the large excess of tonnage and freights, owners have been reluctant to place orders for new tonnage, although a cautious optimism has asserted itself in the recent contracting for deliveries in 1963 onwards. However, the report concludes that early alleviation in the market situation is unlikely.

Copies of the report can be obtained from W. G. Weston Ltd, 26 27 Cockspur Street, London, S.W.1, price £2 each.

The Canadian Oil and Gas Industry

A second major growth wave has started in Canada's oil and gas industry. Unlike the boom period which followed the discovery of oil at Leduc in 1947, the emphasis will be on tapping new markets and not exploration.

The 1961 *Survey of Oils*, published by the Toronto *Financial Post*, has no doubt that Canadian oil will continue to find growing markets in the U.S. The expansion of the Canadian market, it forecasts, will be helped by the government's pressure on the industry to supply the Canadian market as far as the Ottawa Valley.

This most comprehensive 216-page survey contains detailed statistics relating to Canadian production, consumption, imports, exports, and reserves of oil and gas. Over 130 of its pages are devoted to a review of the Dominion's oil and gas companies, their balance sheets, directors, and property holdings. There are also 30 pages of maps of oil and gas fields, as well as an eight-year range of stock prices.

Survey of Oils costs $4 from the *Financial Post*, 481 University Avenue, Toronto 2, Canada.

1961 List of ASTM Publications

The American Society for Testing Materials has published a 62-page List of Publications, which describes the symposia, manuals, special publications, indexes, compilation of standards, charts, reference photographs, and reports published by the Society through the years. Of the more than 300 items described, forty are new and have not been previously listed. The publications cover all phases of materials and their evaluations and are arranged conveniently by titles and subject.

The list of publications is available free from the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pennsylvania.

Loading Tables for Tanker Officers

In the absence of an abundance of literature on the subject, *Loading Tables for Tanker Officers* by P. F. Gladwin is a useful addition to the current range of nautical publications. Its conversion tables include API gravity to specific gravity, long tons to cu ft and cu m, Fahrenheit to Centigrade, freeboard density allowance tables, and density and volume coefficients.

The tables are clearly and concisely printed and were originally devised by the author for his own use. Publishers are the Maritime Press Ltd, 30 Fleet Street, London, E.C.4.

British Standards

Piping systems for the petroleum industry

BS3351:1961 represents, in terms of British materials and manufacturing processes, standards of design and construction basically similar to those laid down in the American Standard Code for Pressure Piping (ASA B31.3, *Petroleum Refinery Piping*).

Basic requirements and recommended practice are given for the selection and application of materials and components of piping systems in the petroleum and petrochemical industries. The design, fabrication, installation, and testing of these systems are also covered. Reference is made to some 80 British Standards and to some 50 American Standards.

It is priced at 30*s* 0*d*.

Class II metal arc welding of steel pipelines

BS2971:1961 is the fourth in a series of British Standards designed to cover the production of welds in pipelines and pipe assemblies of any material used sufficiently widely to warrant its inclusion.

It covers shop and site metal-arc welding of joints in carbon steel pipelines and pipe assemblies up to and including 24-in (610 mm) diameter carrying fluids suitable for Class II conditions and also the standards to which the welds shall conform. It deals with butt welding, with or without a backing ring, where the welding is done from the outside only, and the welding of gusseted bends, sleeve joints, branches, and flanges.

Price of the new Standard is 12*s* 6*d*.

Butt-welded, single point cutting tools and blanks

BS1296:1961, first published in 1946 as an emergency measure, has been revised to keep it abreast of modern metal cutting requirements. The shapes of the working ends of lathe, planer, and shaper tools are illustrated and related to a standard series of 15 tool shank sections.

As well as covering general purpose tools, the standard now covers special purpose tools, and a schedule of tool shapes which have particular applications, such as internal recessing, has been added. Each tool shape is numbered, and information on corresponding inch/metric sizes of tool shanks, as agreed internationally, is given in an appendix to the specification.

The Standard costs 6*s* 0*d*.

Copies of these standards may be obtained from the British Standards Institution, Sales Branch, 2 Park Street, London, W.1. Postage is charged extra to non-subscribers.

MIDDLE EAST OIL PRODUCTION

The Kuwait Oil Co. Ltd's production averaged 1,657,059 b/d during the first 6 months of the year.

	May	*Tons*	*Jan.–May*
Iraq Petroleum Co. Ltd ...	2,969,718		14,926,309
Basrah Petroleum Co. Ltd ...	649,524		3,823,374
Mosul Petroleum Co. Ltd ...	106,946		537,457
Qatar Petroleum Co. Ltd ...	711,349		3,414,166
Iraanse Aardolie Exploratie en Productie Mij	5,278,000		22,970,000
		Barrels	
Arabian American Oil Co. ...	41,638,887		217,496,078
Bahrain Petroleum Co. Ltd ...	1,395,503		6,802,908
Getty Oil Co. and American Independent Oil Co. (Kuwait-Saudi Arabia Neutral Zone)...	4,913,686		22,946,568

The refinery throughput at Abadan of the Iraanse Aardolie Raffinage Mij for May was 1,379,000 tons, the total for 1 January to 31 May being 5,180,000 tons.

Crude processed at Aramco's Ras Tanura refinery during May was 8,177,683 brl, the total for 1 January to 31 May being 38,370,001 brl.

DROP IN U.K. EQUIPMENT ORDERS

The oil companies ordered materials and equipment worth £27,113,000 from British firms during the first three months of this year. This figure was almost £1½ million below the figure for the previous quarter and some £4 million less than that for the corresponding period of 1960.

Compared with the first quarter of 1960, increases were recorded in eight of the twenty categories into which equipment orders are broken down in the table below. The most substantial increases were for: geophysical and other exploratory equipment (357 per cent); specialized equipment for oil refineries, etc. (131 per cent); prime movers and compressors (97 per cent); boilers, boiler house plant, and accessories, etc. (95 per cent).

Tankage (including tank fittings) was 36 per cent lower than in the same period of 1960. There were other noticeable decreases in orders for specialized equipment for oil drilling and production, automotive equipment, and commissary and general requisites, all of which fell by 34 per cent.

It is interesting to note that the greater part of the expenditure, over 57 per cent, was for material and equipment destined for use overseas.

	1961 *Jan.–Mar.*	1960 *Jan.–Mar.*
Geophysical and other exploratory equipment, etc.	43,783	9,582
Specialized equipment for oil drilling and production, including oil casing, tubing, etc.	1,584,609	2,401,983
Specialized equipment for oil refineries, etc. (not including pumps and valves)	2,183,227	946,500
Drums and can-making, filling and cleaning equipment, kerbside pumps and other metering and dispensing equipment, etc. ...	1,077,333	1,548,008
Railcars, road tankers, aircraft refuellers, etc.	794,497	506,092
Drums, drumsheets, and tinplate ...	1,064,636	1,573,047
Tankage (including tank fittings) ...	886,412	1,385,792
Tubulars, pipe fittings, and valves (ferrous and non-ferrous) ...	2,383,074	3,008,462
Pumps (excluding slush, oilwell, and kerbside)	410,786	476,191
Boilers, boiler house plant, and accessories, etc.	213,512	109,706
Electrical equipment—motors, generators, and transformers ...	1,247,016	1,184,695
Instruments, meters and gauges, etc.	577,391	576,395
Prime movers and compressors ...	769,539	389,050
Machine and hand tools, welding and miscellaneous machinery and stores	1,584,174	1,934,220
Ferrous and non-ferrous plates, sections, sheets, and bars ...	636,377	870,794
Automotive equipment, all types ...	1,583,048	2,412,895
Laboratory equipment and chemicals, including hospital and medical supplies	334,186	466,035
Bulk chemicals, catalysts, barytes, etc.	7,576,845	8,264,672
Cement and other building materials and hardware, including timber	586,225	571,302
Commissary, general requisites for office, warehouse, household, club, and sports, etc.	1,576,140	2,384,842
	£27,112,810	£31,020,263

CORRESPONDENCE

To the Editor, the *Institute of Petroleum Review*

Sir,

I should be most grateful if you would allow me to draw attention to a proposal to form a European section of the Organic Geochemistry Group of the Geochemical Society. At present the Organic Geochemistry Group has 250 members, 45 of whom are resident in Europe. The Group held very successful meetings in Denver last Autumn; this year meetings are to be held in Cincinnati.

Discussions on the formation of a European section have taken place recently between Dr U. Colombo of Italy, Dr M. Louis of France, myself, and Dr I. A. Breger, the secretary of the Organic Geochemistry Group. Contacts have also been made in Germany and Holland. The holding of a meeting in Milan in September 1962 is under consideration, with a symposium on analytical methods probably as a prominent feature.

Organic geochemistry has many ramifications: coals, lignites, oil shales, petroleum, peats, soils, and recent and ancient sediments are among the items with which it is concerned. Contacts between those working in different fields may reveal common problems and perhaps contribute to the solution of these problems. The creation of a European section of the Organic Geochemistry Group should aid in the making of contacts. If any readers are interested in such an organization, and care to get in touch with me, I will try to provide any additional information which they may require.

Yours faithfully,

G. D. Hobson.

Imperial College of Science and Technology,
Department of Geology,
Prince Consort Road,
London, S.W.7.
19 *June* 1961

ESSENTIALS OF SOUND MARKETING

"Successful marketing in the long run is not the outcome of luck or a succession of hunches; it is the product of courage based on knowledge." That was the forceful view put by C. T. Brunner, a director of Shell-Mex and B.P. Ltd, to an international conference on "Expanding Markets in a Shrinking World" in the Royal Festival Hall recently.

He said that it was not enough simply to have very good products or policies to sell; it was important that the salesmen should be inspired by a belief in the value of what they were asked to do. He emphasized the importance of senior management spending a good proportion of its time in the field in close contact with the salesmen. So far as is practicable, Mr Brunner said he felt that customers should not be led to suppose that there are other senior individuals who could be prevailed upon to concede more favourable terms than the salesman himself could offer.

One of the problems he dealt with was how to keep a company growing after the obvious opportunities had been exhausted. "Without a constant renewal through fresh ideas," he warned, "growth ceases and decline begins. Even natural monopolies can come to an end as choice widens and substitutes become available".

Lectures, Courses, and Conferences

Current Practice in Fuel Efficiency

The eighth annual refresher course on Current Practice in Fuel Efficiency is being held at the Clarendon Laboratory, Oxford, from 25 to 29 September 1961. The course is designed to present up to date information on developments and research into the more efficient use of fuels, plant, and processing. The registration fee is £11 0*s* 0*d* or £16 16*s* 0*d* with accommodation. Details are available from the National Industrial Fuel Efficiency Service, Ailsa House, 181 King's Road, Reading.

International Conference on Stress Analysis

The Second International Conference on Stress Analysis is being held in Paris on 10–14 April 1962 at 1 Ecole Superieure d'Aeronautiques, Boulevard Victor, Paris 15e, France. Contributions will deal mainly with the results of experimental work, and prospective authors are invited to write to the secretary of the Joint British Committee for Stress Analysis at 1 Birdcage Walk, Westminster, London, S.W.1.

Carbohydrate Chemistry

An international symposium on Carbohydrate Chemistry is to be held in Birmingham on 10–20 July 1962. It is being sponsored by the Chemical Society in association with the University of Birmingham. Details will be available shortly from the general secretary, the Chemical Society, Burlington House, London, W.1.

"Imperfections in Crystals"

The Autumn Conference of the X-Ray Analysis Group of The Institute of Physics and The Physical Society on "Imperfections in Crystals" will be held on 17–18 November 1961, at the Institution of Mechanical Engineers in London.

The three sessions of the Conference will be devoted to the nature of crystal imperfections and of associated diffraction effects, to experimental methods for studying imperfections, and to their influence on the physical properties of crystals.

Programme details are available from the honorary conference secretary, Dr G. S. Parry, A.Inst.P., Department of Chemical Engineering, Imperial College of Science and Technology, Prince Consort Road, London, S.W.7. Applications to attend should be made to the administration assistant, The Institute of Physics and The Physical Society, 47 Belgrave Square, London, S.W.1.

Rheological Techniques

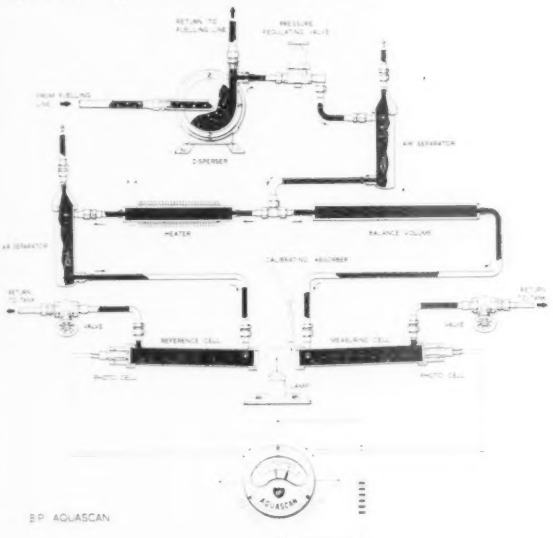
The British Society of Rheology and the Non-Destructive Testing Group of the Institute of Physics and the Physical Society are holding a joint conference on Rheological Techniques in Llandudno from 20 to 22 September 1961. A wide range of techniques will be discussed and apparatus will be demonstrated. The meeting will be open to persons who are not members of the Societies, and workers in fields not primarily concerned with physics or mechanics. Details of the programme can be obtained from Dr Peter Lord, Royal College of Advanced Technology, Peel Park, Salford, 5.

Equipment Developments

Measurement of Water in Aviation Fuels

The necessity for ensuring the cleanliness of aircraft fuel has become increasingly important. The major problem encountered by the suppliers of the fuel is measuring accurately the water and solid content of fuel actually being delivered into the aircraft.

Work carried out at the BP Research Centre in an endeavour to provide a satisfactory answer to this problem has culminated in the development of the "BP Aquascan", measuring on a continuous basis the undissolved water content of aviation turbine kerosine, and, if required, other aviation fuels.



Diagrammatic layout of the operation of the BP Aquascan

Water in suspension is present in a fuel in the form of extremely fine droplets, which produce a cloudy or hazy appearance which may not be visible to the untrained eye. Light rays falling on to the fuel render the droplets easily visible as some of the light is absorbed by these droplets. This natural phenomenon is the basis of the operation principle of the BP Aquascan.

A light absorption comparator has two beams from a single light source, which are compared photo-electrically. One beam passes through an absorption cell filled with fuel exactly as sampled from the fuel delivery stream; the other passes through an identical cell filled with heated fuel. The heating causes any undissolved water to pass from suspension to solution and cease to be visible. The second cell contains a reference fuel visually identical with the fuel being delivered apart from its light-absorption potential. An optical comparison of the cloudy and clear samples will show the degree of light absorption in the unheated sample—attributable to undissolved water—which is shown on a dial. If the undissolved water content of the fuel exceeds the permitted maximum an automatic shutdown device stops the flow of fuel.

An Air BP fueller fitted with a BP Aquascan

New Method of Storage Tank Protection

When a 115 ft tank at Mobil Oil Co.'s Coryton refinery recently needed reflooring a new method was used to provide a non-corrosive base. The original steel plates were first blast-cleaned to remove rust and scale and then an epoxy resin intermixed with chopped glass fibre was applied.

The glass fibre and resin were sprayed simultaneously over the surface by a specially designed pistol incorporating twin nozzles for the resin and catalyst, and a device which continuously draws in glass fibre, chops the strands in pre-determined lengths, and directs the chopped fibre into the resin stream. The finished mat set to a tough, non-porous mass which was completely corrosion-proof and flexes with the steel floor during the filling of the tank without deterioration.

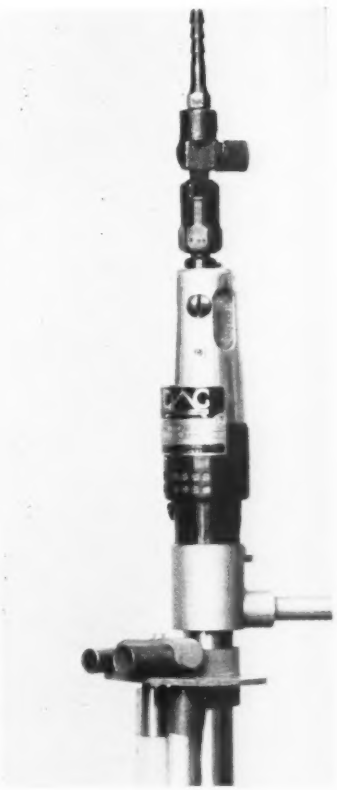
This method of repairing tanks was developed by Liquid Metal Applications Ltd, and is claimed to be quicker and cheaper than previous adaptations of the glass fibre method in which the plates were first coated with the catalysed resin and then covered with sheets of glass fibre from a roller.

Flameproof Submersible Pumps

The latest additions to the range of Gunn submersible pumps are designed for use where fire risk is a prime consideration. Being air-powered they eliminate the need for expensive flameproof wiring and safety certificates.

There are two models available, the standard and the drum and barrel emptying pump, with outputs of up to 1000 gal/hr with heads well in excess of 25 ft being obtainable. All immersed parts are in stainless steel to render the pumps suitable for use in a wide range of corrosive chemicals.

They are fully portable and no permanent installations are required. The silenced motor is rated for operation on 90 psi air supply, but is capable of working at reduced rate down to 40 psi.



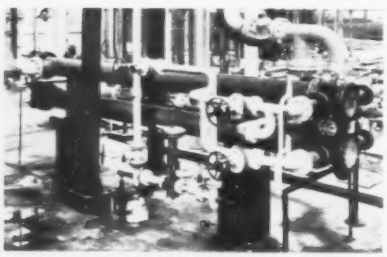
Gunn Flameproof Pump

Self Priming Pumps for Hot and Volatile Liquids

A new range of pumps of the regenerative type and self priming on the liquid ring principle has been introduced by Precision Electrical Products (Stockport) Ltd. Known as Type 14, the dynamic suction lift amounts to 28 ft and the pump will evacuate a line of up to 300 ft in length. Unlike a conventional centrifugal impeller, the new pumps do not lose prime if air or gases enter the pump casing. They are, therefore, suitable for handling hot or volatile liquids and can be used for handling liquids having entrained air or gases. Their maximum capacity is 140 gals/min and the maximum head obtainable is 300 psi.

Trade Literature, etc.

Aluminium Heat Exchanger's First Year



The aluminium heat exchanger is installed at Mobil's Coryton refinery

What is probably the first all-aluminium heat exchanger to be installed in a British refinery was inspected recently after one year of service. It was found to have resisted the attack of the hydrocarbon gas, containing 10 per cent H_2S and a trace of water vapour, which passes through the shell side at 220 F, and to have withstood the corrosive properties of Thames estuary water which passes through the tubes at 6 ft sec. There was some light pitting on the outside of the tubes due to carry-over of particles of rust from other sections of the plant.

The tubes, which were supplied by Alcan Industries Ltd, are of *Noral 3S* alloy and clad with *Noral 72S* alloy metallurgically bonded to the inner surface. The 72S alloy (aluminium with 1 per cent Zn) is anodic to the 3S alloy and acts sacrificially in protecting the tube against corrosion.

Waste Water Treatment

Universal Oil Products is to handle licensing arrangements for a waste water treatment process developed by Sun Oil Company of Philadelphia. The Sun "Water Management" process permits re-use of certain refinery waste water streams as make-up water in cooling towers. Through biological oxidation within the tower, concentrations of phenols and related chemicals are substantially reduced. The process is reported to reduce phenol content at Sun's Toledo refinery by 99.9 per cent without creating objectionable odours.

British Engines for Russian Cars

The 1·6 litre Perkins *Four 99* diesel engine is to be fitted in Russian Volga cars assembled by Beherman-Demoen, a well-known Belgian motor firm, in Antwerp. More than 100 *Four 99* engines have already been fitted in Volga cars in Finland.

Pye Exhibits in Moscow

W. G. Pye & Co. Ltd will be among the exhibitors at the Fifth International Congress of Biochemistry in Moscow this month. Included in the equipment they will be showing is the Pye Argon chromatograph, pH meters, low level dc amplifiers, and the precision decade potentiometer.

Precision Balances

The *Unimatic* single pan constant load balance, produced by Stanton Instruments Ltd, now covers a range of models with sensitivity varying from 1 mg to 0·01 mg, by vernier. In addition the Stanton thermobalance has been further developed and is now capable of reaching the temperature of 1550 C.

Fire Fighting Developments

The Pyrene Co. Ltd has developed a new dry chemical which can be used in conjunction with foam in fighting fires. Previously, some standard types of dry chemicals have reacted with foam to decrease its consistency.

Another recent development by the same company is a trailer-mounted foam generating unit designed mainly for use in oil refineries, tank farms, tanker jetties, and chemical works. It projects a jet 180 ft–200 ft long or 75 ft high. It can deliver mechanical foam at 5000 Imp gal min, or water at 500 Imp gal min.

Chamberlain Group's Caribbean Subsidiary

The Chamberlain Group's structural engineering company, Sanders & Forster Ltd, has formed a Trinidad subsidiary, Sanders & Forster (Caribbean) Ltd.

Torque Motor Leaflet

A revised edition of the de Havilland Aircraft Co. Ltd's leaflet describing the Company's electromechanical torque motor series 2 was published recently. It lists the motor's technical characteristics and gives performance curves. Copies can be obtained from the Company at Hatfield, Hertfordshire.

Sunray Hydeal Unit Goes on Stream

Sunray Mid-Continent Oil Co. refinery at Corpus Christi, Texas, has started operation of a UOP Hydeal unit capable of producing 750 bsd of benzene, and another 1000 bsd Hydeal is under construction at the Company's Tulsa refinery.

The Corpus Christi unit is integrated with Platforming and Udex units. The toluene separated by the Udex unit from aromatics produced by the Platforming unit is hydrodealkylated in the Hydeal unit, using hydrogen produced by the Platformer.

Cationic Surface Active Agent

Creto, a quaternary ammonium compound and a member of the cationic group of surface active materials, is the subject of a technical data sheet available from Croda Ltd, Cowick Hall, Snaith, Goole, Yorkshire. *Creto* can be used in the fixation of dyestuffs in fibres and increases the infinity of cellusic fibres for acid-dyestuffs. It can also act as an anti-static on fibres and plastics, and as an emulsifying agent.

Vacuum Pressure Pump

Edwards High Vacuum Ltd has been appointed U.K. and Commonwealth agent for the *Reciprotor* combined vacuum pressure pump manufactured in Denmark.

The pump is available in two versions. Type 406G, designed for continuous operation, provides a free air displacement of 1·62 cu ft min, a vacuum of 18 in Hg, and a maximum pressure of 7·8 lb psi. Type 606G is rated for intermittent operation only but delivers air at 1·77 cu ft min, attaining a vacuum of 22 in Hg and a maximum pressure of 10·7 lb psi.

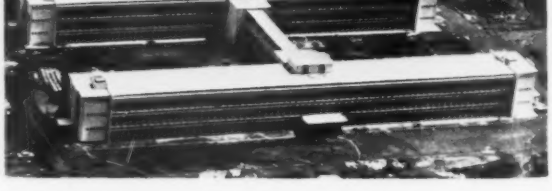
Polystyrene Plant for Rumania

Petrocarbon Development Ltd recently signed an agreement with the Rumanian State Enterprise for Foreign Trade for an £800,000 polystyrene plant. This is the first major order for a chemical plastics plant since the signing of the Trade Agreement between Rumania and the U.K. last autumn.

The Origins of Petroleum—a New Theory

The latest edition of *Catalyst*, the Shell Chemical Co. Ltd's industrial magazine, contains an article by Sir Robert Robinson on "The Origins of Petroleum". In it he discusses critically the conventional view that the origin of petroleum was purely biological and presents a new theory suggesting a duplex origin of mineral oils. Copies of the magazine are obtainable from the Company at 170 Piccadilly, London, W.1.

This new £700,000 headquarters building for the Niger Delta region activities of the Shell-BP Petroleum Development Co. of Nigeria Ltd was opened recently by Alhaji Sir Abubakur Tafawa Balewa, the Prime Minister of Nigeria, at Umuobiakani, near Port Harcourt. The three storied building has a main framework of reinforced concrete columns and beams. Each of the two main blocks are 445 ft long. Construction was carried out by Taylor Woodrow (Nigeria) Ltd



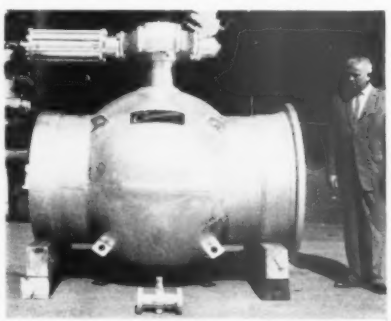
ICI Export Brochure

A colourful and excellently printed brochure printed in English, German, French, and Russian, describing the export range of the Heavy Organic Chemicals Division of ICI, was distributed to visitors to the Company's stand at the British Trade Fair in Moscow recently.

The brochure, which will be followed by two similar editions, one in English, French, German, and Italian, for European and world distribution, and the second in English, German, Spanish, and Portuguese, particularly for use in South America, is available from ICI at Imperial Chemical House, Millbank, London, S.W.1.

World's Largest Ball Valve

What is believed to be the world's largest ball valve, the 42-in × 36-in × 42-in flanged end and welding end valve has been manufactured by Cameron Iron Works Inc. for a major oil company. It will be used as an emergency shut-off valve on a 42-in pipeline from storage on shore to a marine loading platform located offshore in the Mediterranean. It is 300 lb ASA classification, 720 lb working pressure, and 1100 lb test pressure. Since the pressure downstream will be negligible it is equipped with a 175 lb 42-in flange.



The largest and smallest ball valves manufactured by Cameron Iron Works Inc

By way of comparison, shown in the foreground of this photograph is a 2-in × 1½-in × 2-in flanged by flanged, 600 lb ASA class valve, the smallest ball valve manufactured by the Company.

Gas Liquid Chromatography

Primarily intended as a comprehensive brochure to describe the new version of the Pye Argon Chromatograph, a new publication from W. G. Pye & Co. Ltd contains details of many techniques which have recently been developed in the field of chromatographic analysis. Copies are available from the Company at Granta Works, York Street, Cambridge.

Improved Efficiency for Shell Detergent

Shell Chemical Co. Ltd has introduced a new grade of its *Teepol* synthetic detergent which is claimed to be 50 per cent more efficient than previous grades.

Oil-Fired Cooking and Heating

Enamel and Heating Products Ltd of Sackville, New Brunswick, Canada recently introduced its oil-fired domestic products to the English market. These include heaters, cooking ranges, and caravan stoves.

Cape Asbestos Investment in Mexico

The Cape Asbestos Co., Ltd has taken a financial interest in Aislantes Industriales, SA de CV of Mexico City, manufacturers of foamed polystyrene insulation products and asbestos *Aircell* pipe covering for low temperature work. As a result Cape Asbestos thermal insulation materials will shortly be manufactured in Mexico.

Mexico will be the twelfth country in the world in which these materials, made from amosite asbestos produced in Cape Asbestos mines of the Union of South Africa, are manufactured.

Joint Marketing Project

Under new joint marketing arrangements involving two member companies of the Elliott-Automation Ltd Group, The Rheostatic Co. Ltd will sell the solenoid-operated valves and the pressure and flow switches of Black Automatic Controls Ltd to the heating, ventilating, and air conditioning industries under the name "Black-Satchwell", together with its own Satchwell controls.

Black Automatic Controls Ltd is opening a sales office in London at Steel House, 11 Tothill Street, London, S.W.1 to enable a full technical sales service to be made available in London.

Spectrographically Standardized Substances

In the new edition of its booklet "Spectrographically Standardized Substances," the metallic impurity contents, as detected spectrographically, of Johnson Matthey products are uniformly stated in parts per million, and higher impurities than previously offered are quoted for many products. The booklet is available on request to the Company at 73–83 Hatton Garden, London, E.C.1.

Dutch Subsidiary for Flexibox Ltd

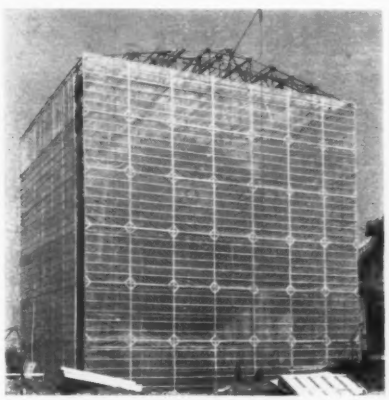
A new firm, to be known as Flexibox NV, has been formed jointly by Flexibox Ltd and their Dutch agents, Technisch Bureau Vaillant & Sluyterman, in Holland to handle sales of Flexibox mechanical seals in the Benelux countries. The parent company's other European subsidiaries are located in Paris and in Frankfurt.

Corrosion Protection

Croda Ltd has issued a technical data sheet describing *Promex* cold applied strippable coating, which is claimed to prevent abrasion of many smooth and unpainted surfaces and to offer protection against corrosion to mild steel. It has proved useful where it is not possible to dip items into thick-film coatings applied from heated baths.

Polythene Shelter for Weather Protection

To give weather protection to men erecting a butadiene storage sphere for I.C.I. at the Wilton works, Yorkshire, Whessoe Ltd constructed this shelter consisting of heavyweight *Visqueen* polythene building sheets attached to light timber frames. Each side of the shelter measures about 50 ft wide by 60 ft high. The structure also serves to isolate sparks caused by electric welding of prefabricated sections of the sphere.



The sides of the shelter are secured direct to the scaffolding to hold them in place

Viton Fluoroelastomer

Because of its solvent resistance and dimensional stability, *Viton* fluoroelastomer is being used for a number of dynamic seals in the new 1400 series *Meteor* gasoline pump produced by Wayne Tanker and Pump Co. Ltd. Comparative 48-hour immersion tests on various materials in aromatic fuels showed the material, which is manufactured by the Du Pont Company, to have less than 1 per cent volume swell, compared with that of at least 15 per cent for other materials tested.

British Equipment to be Produced in Mexico

Kestner Evaporator and Engineering Co. Ltd has licensed Dicon, S.A. de C.V. to manufacture many of its products, including chemical evaporators, crystallizers, and driers, in Mexico City. The Mexican company will also produce the heat transfer equipment of the Richard M. Armstrong Co. of Pennsylvania. They have under construction a new plant where the British and American designed equipment will be built.

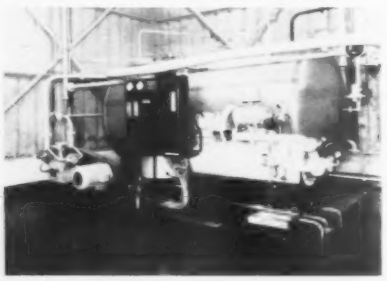
Diphenyl Mercury

A simple, direct process for the production of diphenyl mercury has been developed by F. W. Berk & Co. Ltd. Formerly an expensive "laboratory" chemical, it is now available in commercial quantities, and as the manufacturers believe that many new uses will now be found for it they are making available literature references relating to the compound and its applications, free samples, and technical advice. Details can be obtained from the Company at Berk House, 8 Baker Street, London, W.1.

Inert Gas Reduces Fire Hazard

To minimize the fire hazard, the storage tanks at the Rock Ferry tanker cleaning berth operated by Mersey Tanker Services Ltd are blanketed with inert gas supplied by a 10,000 cfh oil-fired Holmes inert gas generator and compressed to a pressure of 100 psi into a receiving vessel.

The gas is normally supplied from this vessel via a reducing valve



The Holmes oil-fired inert gas generator

and needle valves which maintain the correct composition of gas in each tank. During pumping operations, however, inert gas is supplied from the generator. There are six tanks in all, two 1500 tons capacity oily water ballast tanks, one 700 tons capacity oil fuel storage tank, two 240 tons capacity oil fuel settling tanks, and one 70 tons capacity oil fuel daily service tank. Two thermostatic valves are fitted in each storage tank, with a direct connexion at 100 psi to the receiving vessel.

Process Plant Efficiency

Details of a comprehensive service offered to process plant users by Head Wrightson Process Ltd, are given in a new leaflet available from the Company's offices, 20 24 Old Street, London, E.C.1. The service covers water and effluent treatment, and industrial heating and cooling.

Pumps for Texaco Tanker

The cargo oil pumps for the new Texaco tanker being built by Harland & Wolff Ltd will be of Worthington-Simpson single-stage, high efficiency low NPSH type driven by turbines supplied by the Worthington Corporation of America.

Foster Wheeler CJB Australian Tie-up

Since they will be undertaking the design, engineering, supply, and construction of the process units for the lubricating oil project at the Kwinana refinery, Foster Wheeler Ltd has established an organization in Australia by an association with Constructors John Brown (Australia) Pty, Ltd.

Thin Film Holiday Detector

Metal and Pipeline Endurance Ltd has developed a thin paint film holiday detector which, it claims, will accurately determine pin holes, voids, or bare spots in a surface coating with a very high electrical resistance brushed or spread on to an electrically conductive surface such as steel or concrete.

It is non-destructive, and the applied voltage never exceeds 70v. Two models are available, one with a pistol grip handle, and the other with a belt attachment which will not hamper the operator's activity on high structures where it is necessary to climb.

Alenco Buy Dutch Companies

Alenco Ltd has purchased two Dutch Companies, Ermeto Productie Maatschappij N.V. and P. L. W. De Ridder & Co., N.V. (Ridco), formed in 1948 to manufacture and market Ermeto fittings in Holland. As a result, the British Ermeto Corporation, one of the Alenco Group of Companies, will also supply Ridco with Ermeto fittings, particularly those which cannot be economically produced by E.P.M.

Oil Filtering in Transformers

An article in the latest issue of the *Wiggin Nickel Alloys* magazine discusses "Greater Security in Transformers by Filtering the Insulating Oil." It includes a technical description, together with a flow diagram of filter equipment designed by Stream-Line Filters Ltd. Copies can be obtained from Henry Wiggin & Co. Ltd, Wiggin Street, Birmingham, 16.

Forthcoming Meetings

THE INSTITUTE

(At 61 New Cavendish Street, London, W.1, 5.30 p.m.—tea 5 p.m.)

The Effect of Variation of Base Lubricant Viscosity on Coefficient of Friction During Metal Deformation. L. H. Butler, M.Sc. (Eng.), M.Sc., Ph.D. (Wales), F.Inst.Pet., A.M.I.Mech.E. **6 September**

Airborne Techniques in Petroleum Exploration. W. Domzalski, A.R.S.M., B.Sc., D.I.C., Ph.D. **20 September**

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Career prospects: opportunities to compete for pensionable appointment: facilities for further education for Experimental Officer Class.

Salaries: Scientific Officer on scale £773–£1,267 or for more suitably experienced Chemists on scale £1,392–£1,714 (min. age 26). Experimental Officer Harefield £478 (18 yrs.), £841 (26 yrs.), £1,023 (max). Swynnerton £450 (18 yrs.), £776 (26 yrs.), £983 max or for more suitable experienced Chemists on scale £1,057–£1,296 Swynnerton, £1,132–£1,386 Harefield. Forms from Ministry of Labour, Technical and Scientific Register (K), 26 King Street, London, S.W.1, quoting F 377/1A (S.O. post) or F 376/1A (E.O. post).

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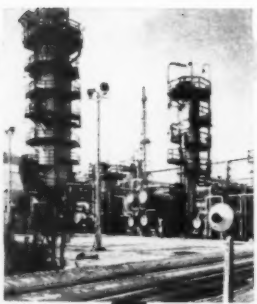

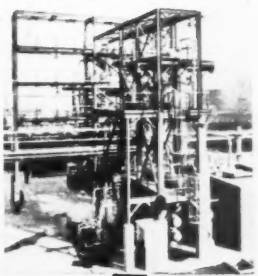

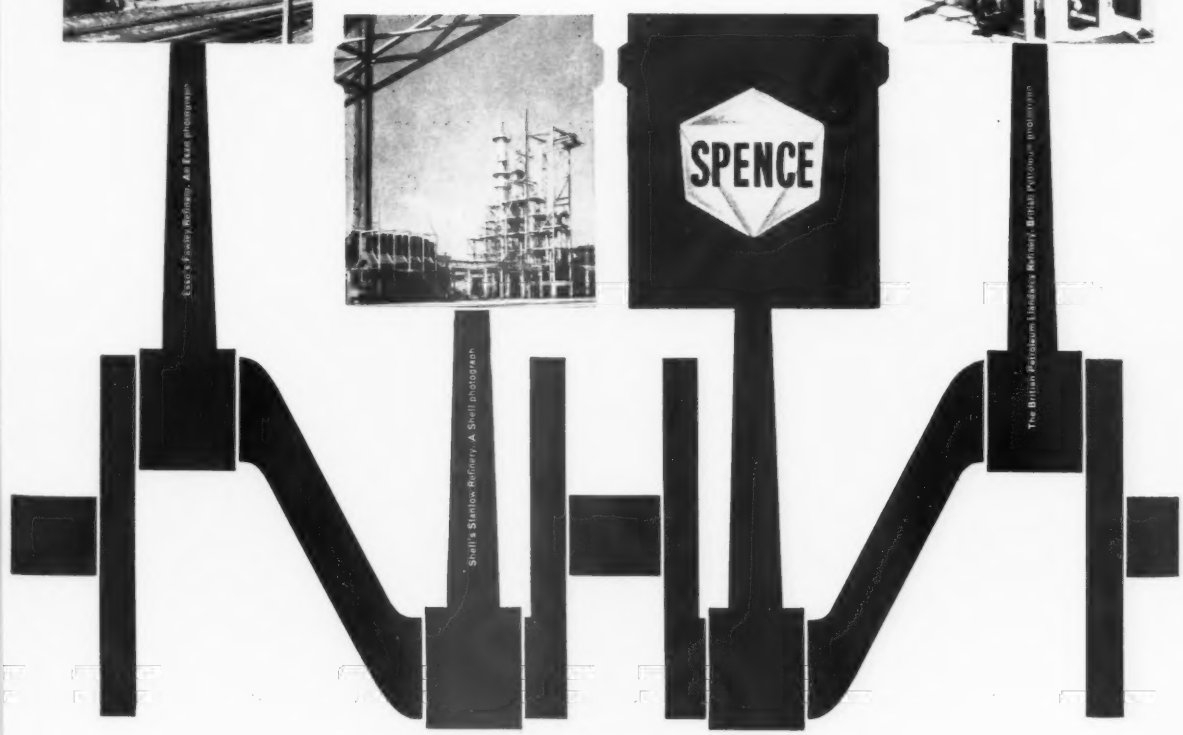
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Esso's Fawley Refinery. An Esso photograph
Shell's Stanlow Refinery. A Shell photograph
The British Petroleum Llandarcy Refinery. British Petroleum photograph

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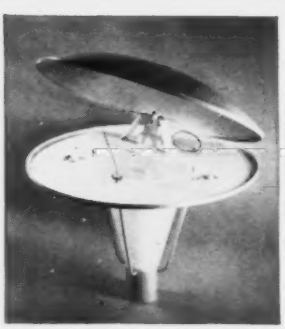

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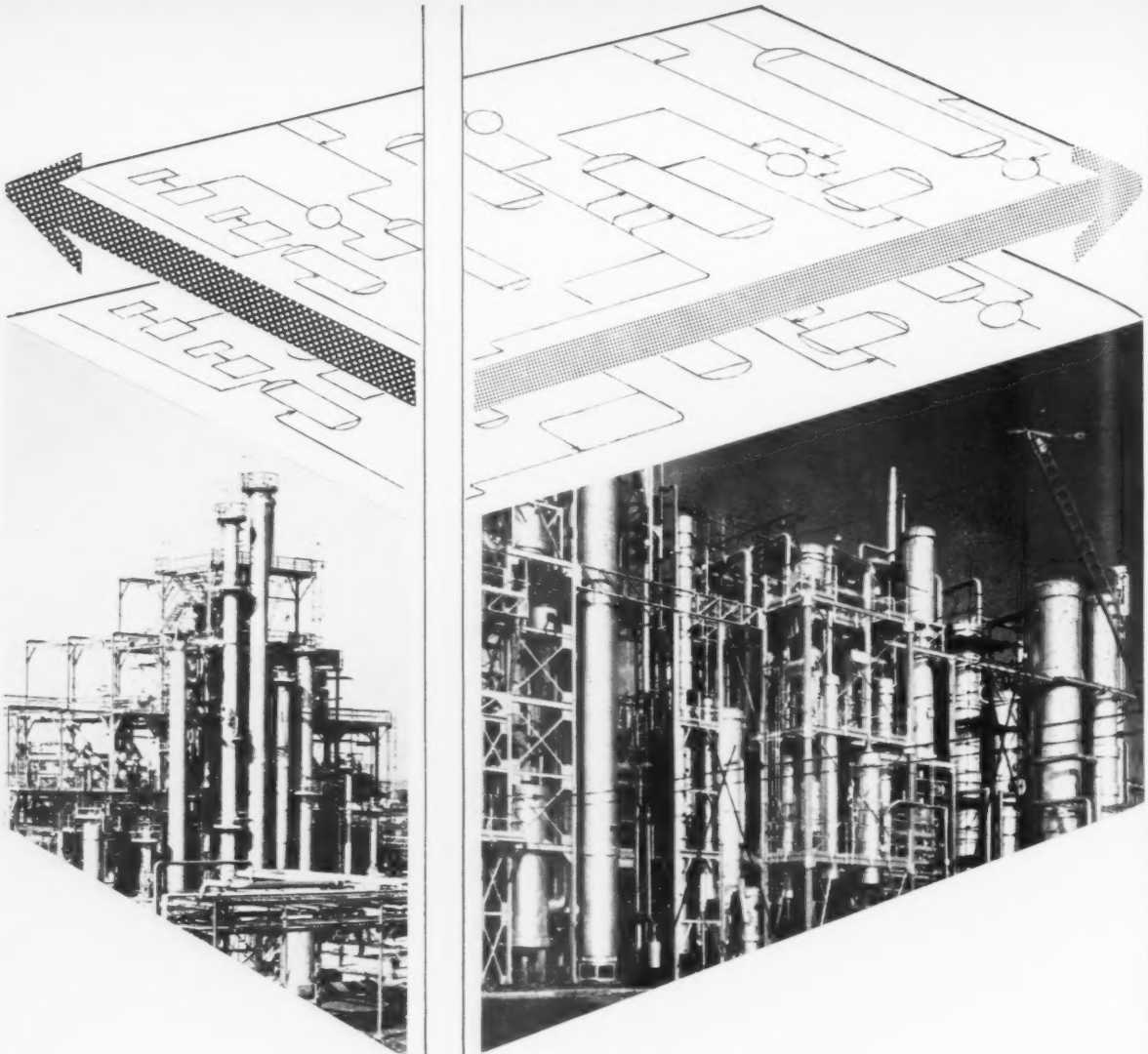

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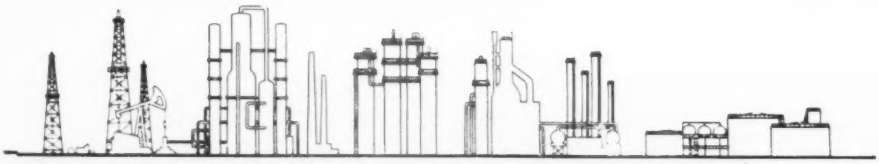

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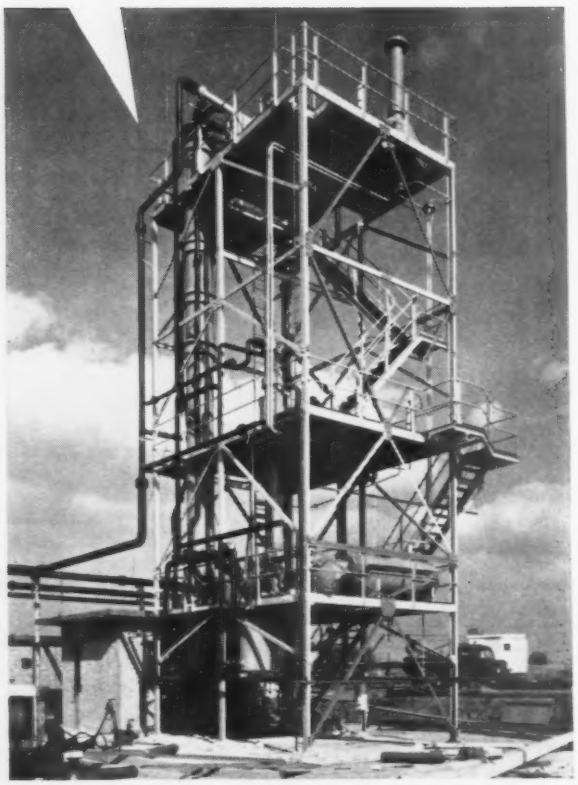

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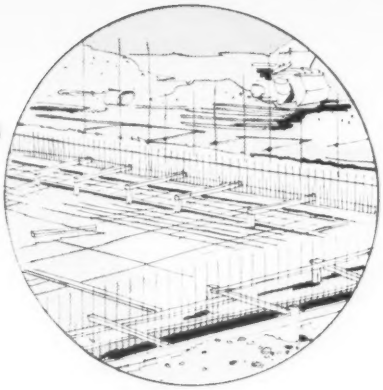

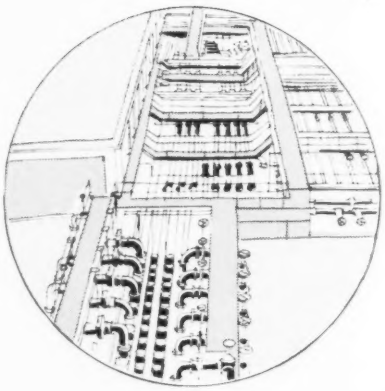

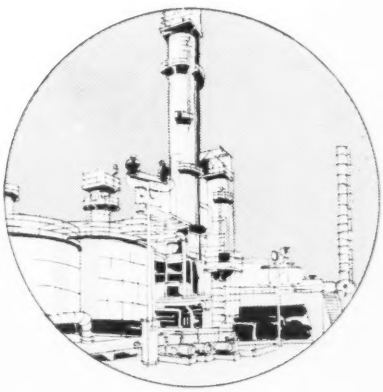

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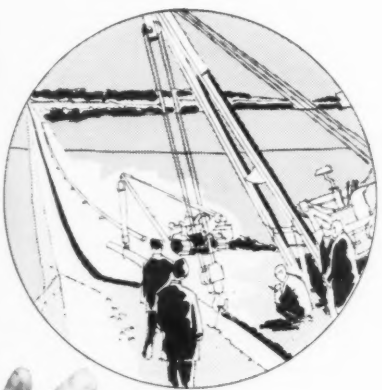

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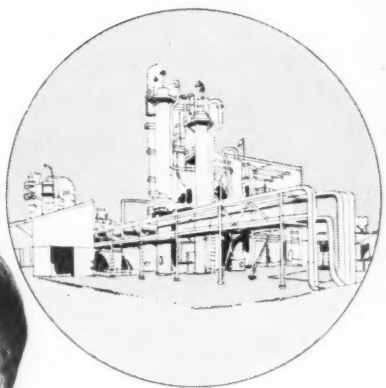

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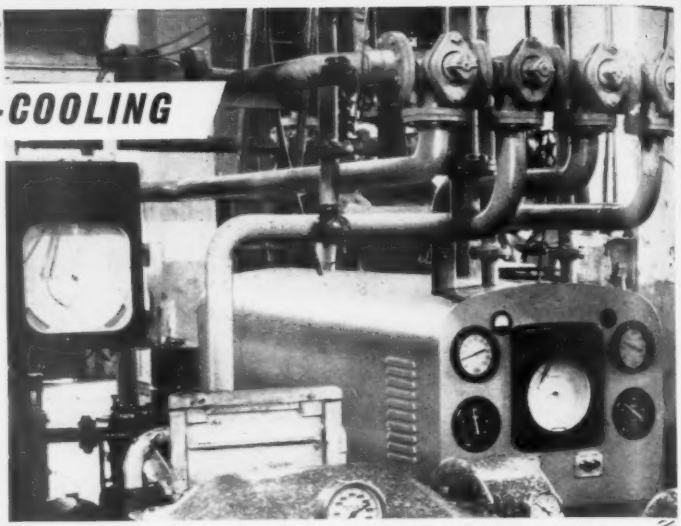

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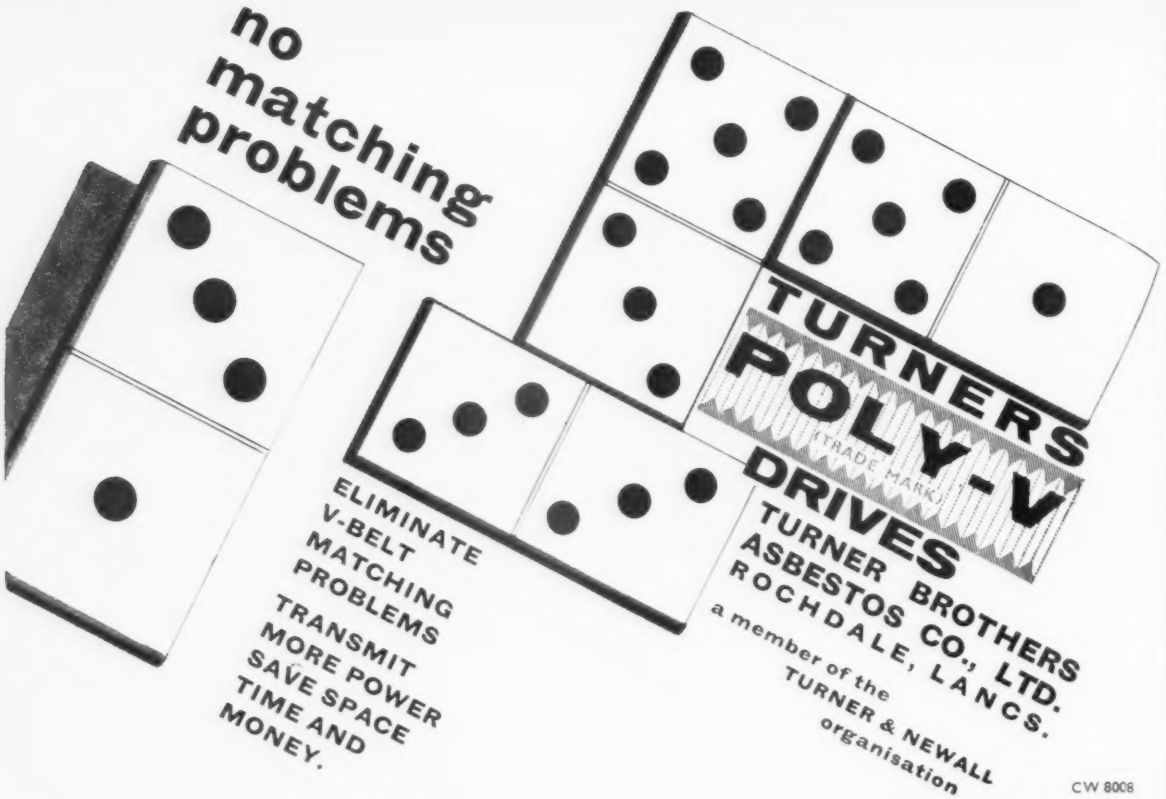

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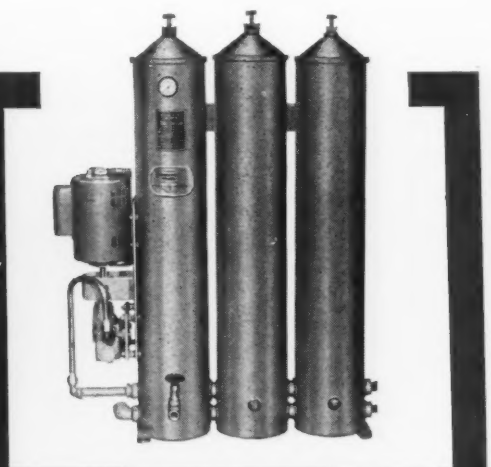

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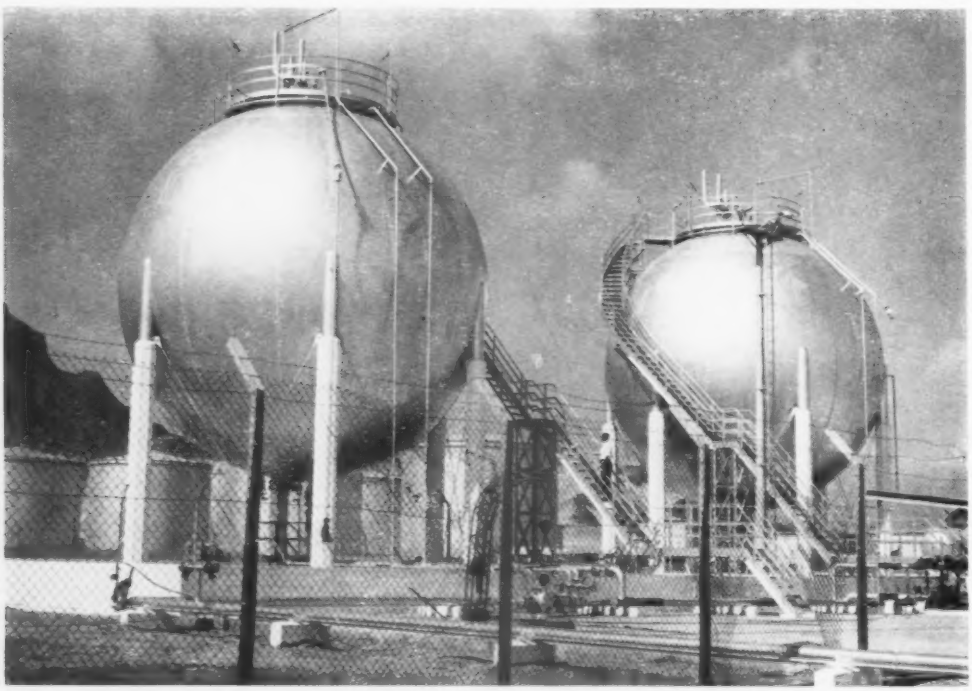

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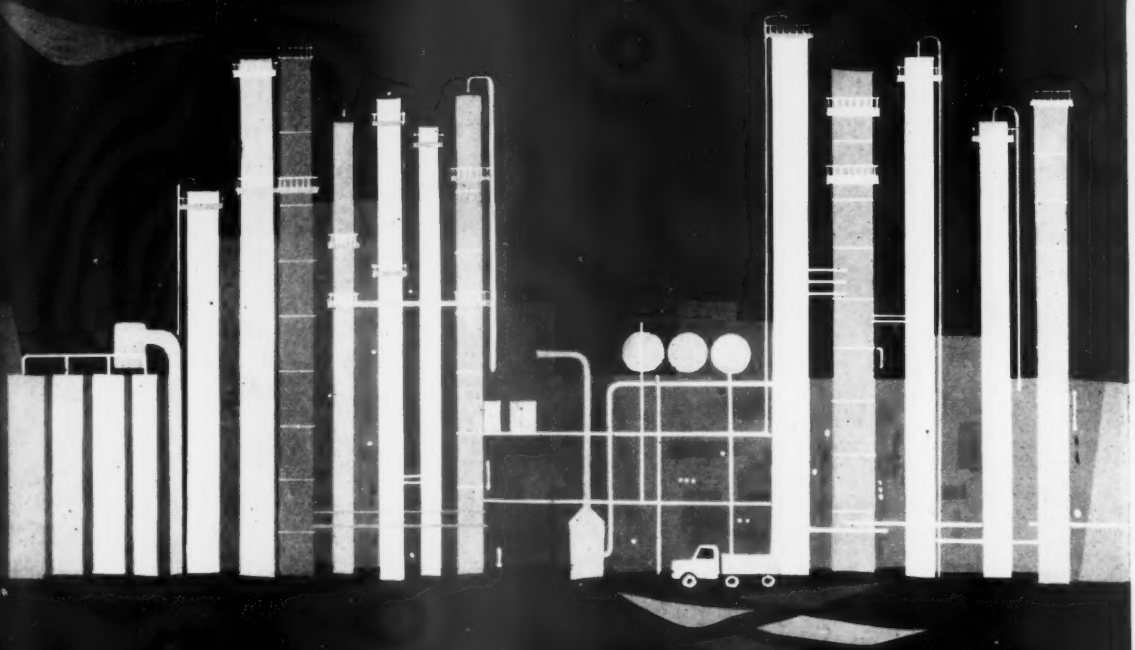

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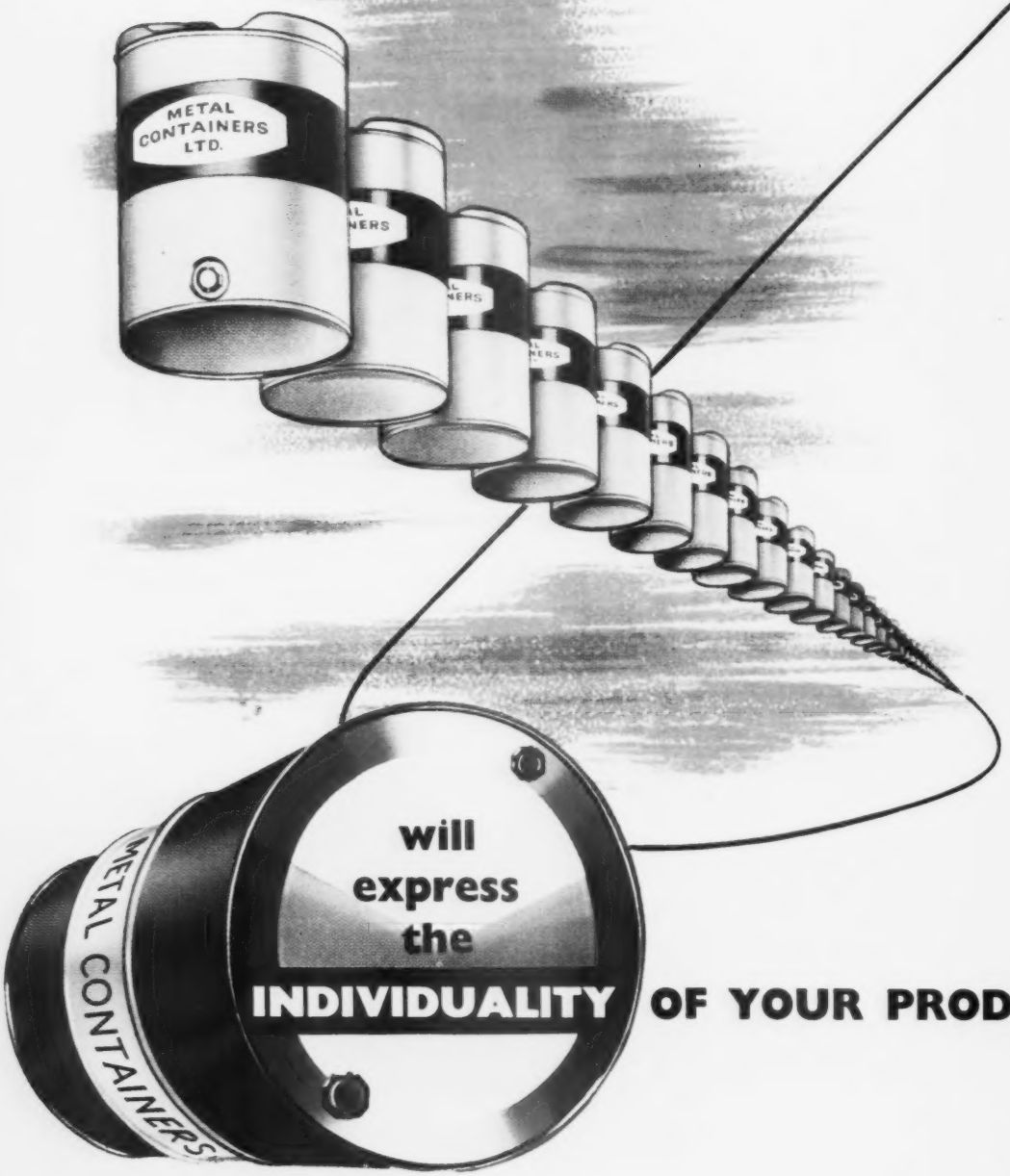

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